COMING CLEAN AT HOME

GARBAGE

The Practical Journal for the Environment

MARCH/APRIL 90

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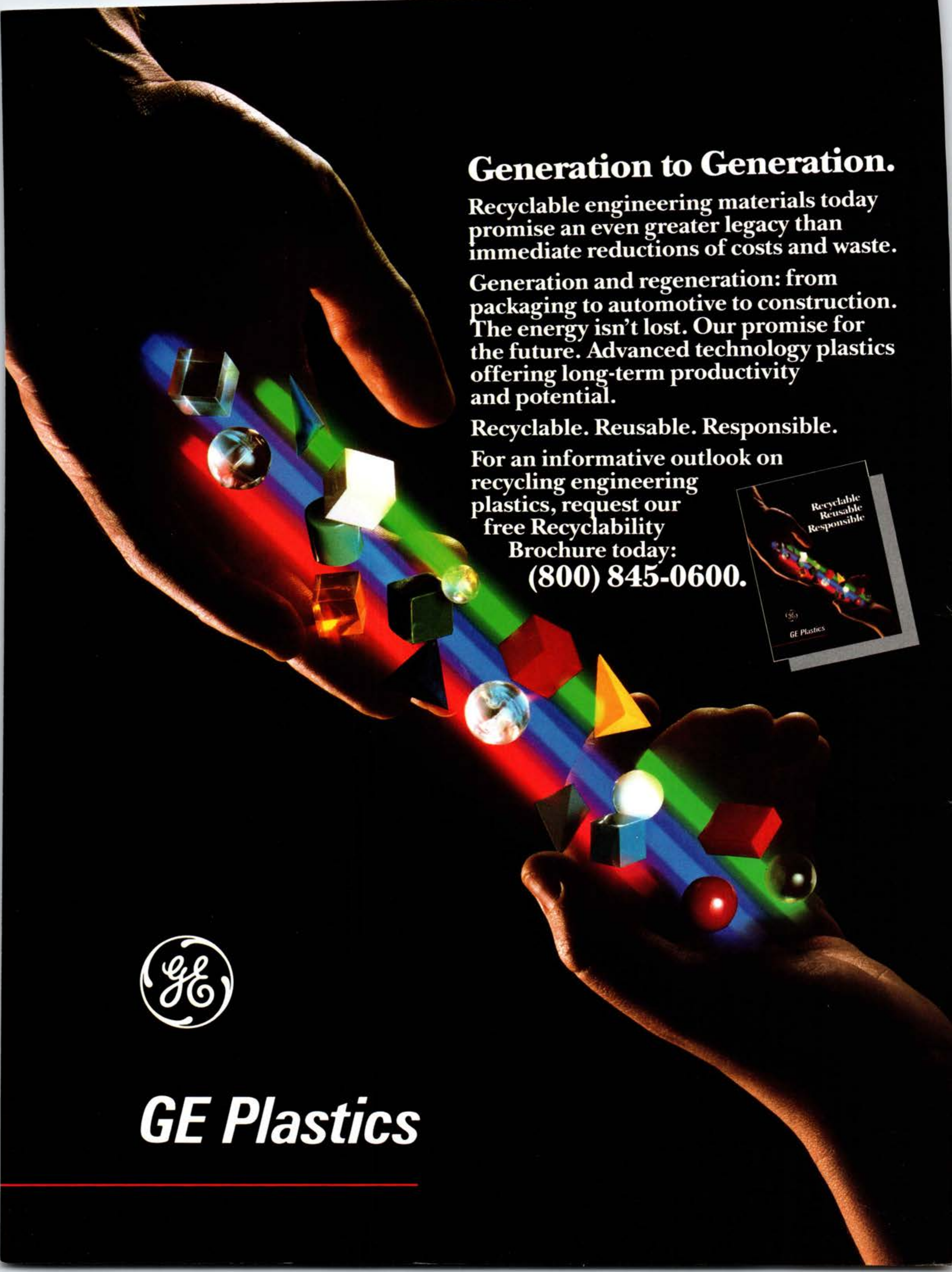

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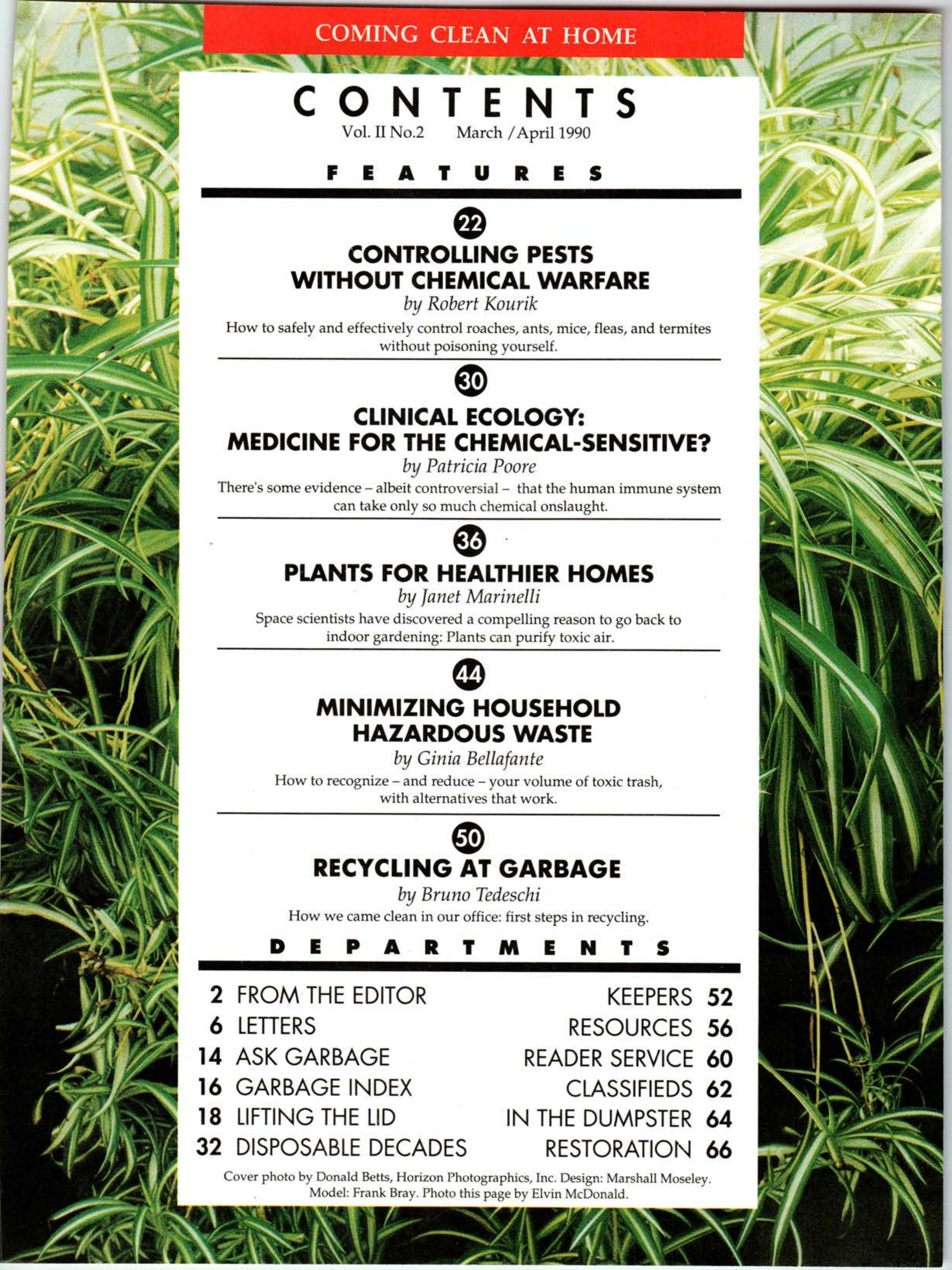

COMING CLEAN AT HOME

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Model: Frank Bray. Photo this page by Elvin McDonald.

FROM THE EDITOR

These thoughts are excerpted from an in-office memo to **GARBAGE** *editors and contributors. It's also a renewed promise to readers.*

Dear Staff,
We've come a long way from "let's publish an unaffiliated environmental magazine" to this fourth issue of **GARBAGE**. Some things about the evolution of the magazine have been a surprise even to me. We've broken some rules (starting with the name and the recycled paper). We've launched a journal that is much of what I'd hoped it would be: It's practical; it dispenses with jargon; it admits complexity; it has a sense of humor; it's responsive to readers. We're off to a good start, and growing faster than I would have dreamed.

But you know what? I'm not satisfied.

I want more. We're adding sixteen pages with the next issue, so I'll get part of my wish. More pages will let us cover complex stories; for example, I'd like to do investigative work, covering two (or more) sides of tough issues. But that isn't all I want. I want MORE of what we set out to make this magazine. I want us to be *more* practical, *more* open-minded, *more* concise.

Let's review some of the things we told each other we wanted, back in the planning stages before the daily grind started:

(1) **GARBAGE** is dedicated to exploring the truth about environmental issues. That means we want to hear from manufacturers and chemists as well as ecologists and activists. When you're gathering information, don't overlook the concentrated, real-world knowledge to be found in sources who are not activists. Seek out those who work with a material or process, but who aren't in the public eye.

This kind of "both sides" journalism doesn't just get us a better story. It's also the way to get the whole world involved in environmental issues. There are plenty of magazines with environmentalists talking to environmentalists. In **GARBAGE**, I want environmentalists and industry, legislators and educators talking to each other.

(2) We are essentially a practical science magazine, as opposed to a political magazine. Of course, some changes — perhaps even most — are beyond the individual to make alone. But society-wide changes supported by legislation are usually the result of a groundswell of public understanding and demand. Making informed choices about how much we're willing to sacrifice environmental quality to pay for luxuries is a practical need. Even when politics is involved, we can educate through science-based articles rather than political articles. For example, we have to understand that voting against nuclear-energy development means absolutely nothing unless we're willing to turn down the thermostat or support alternate-energy research or both. If being anti-nuke means we're pro-coal, we're simply voting for sulfur dioxide. **GARBAGE** will not avoid such issues as these ... and it will also go on to explain in lay scientific terms just what sulfur dioxide does. That, to me, is more valuable in the long term than listing the anti-nuke voting records of senators. This is what I mean about being science-based rather than politics-based.

(3) **GARBAGE** aims to bridge the gap between "trade" and "consumer." We want to be above reproach technically, yet be engaging to read. We'll maintain our independence — from political maneuvering, from the environmentalist crusades, from advertisers — yet we won't be afraid to be passionate or to take a stand.

GARBAGE must be entertaining as well as edifying. This subject matter can get depressing; humor can provide a psychic balance. So can warmth and passion.... Develop the ability to forego not only preprocessed thought, but also that hands-off, no-comment journalism so prevalent in journals that take themselves seriously. I'm not talking about opinions passing for facts. I'm suggesting that we should occasionally stand back and cut through the crap and speak clearly about what is common sense, what is plain, what is human.

Patricia Poore

In the next issue of
GARBAGE

PACKAGING

Good Guys & Bad Guys

Degradable
Plastic Delusion

Model Supermarket

•

How to Buy
Recycled Paper

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VOL.II NO.2

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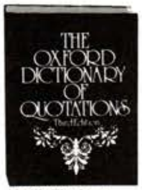
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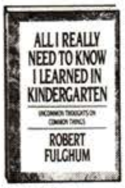
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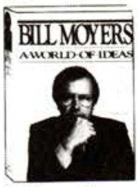
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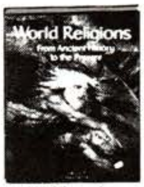
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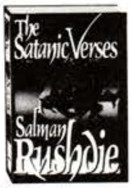
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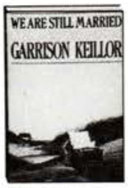
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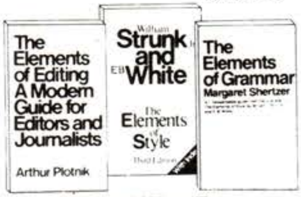
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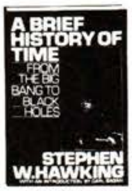
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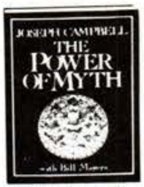
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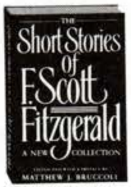
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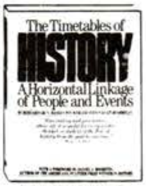
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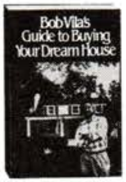
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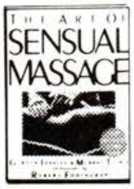
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LETTERS

Two letters responding to our "After the Flush" issue, Jan/Feb 1990, followed by more controversy regarding our advertising policy.

Congratulations on your excellent article on alternative sewage treatment (Jan/Feb, "After the Flush: The Next Generation"). You have stated that the roots of some species of aquatic plants remove toxic metals, trace organics, and even radioactive elements. Unfortunately, toxic metals and radioactive elements cannot be broken down like organic wastes, and they must still be in the plant when it dies. What happens to these heroic plants after they have absorbed these nasty things and "died with their roots on?"

Peter Gibeau
Madison, Wis.

You've put your finger on one of our most intractable pollution problems – heavy metals. Unlike nitrogen and phosphorous or even most organic chemicals, metals don't get transformed into plant tissue, they get trapped *in plant tissue. Not much harvesting of plants needs to be done at most sewage-treatment marshes. At the solar aquatics facility in Providence, Rhode Island, plants are monitored carefully and individual plants are removed from the system before metals accumulate to such high levels that they can't be safely composted. This is still environmentally preferable to what happens at conventional treatment plants, where effluent tainted with heavy metals is discharged into waterways (where it can contaminate food chains), and where metals become concentrated in the huge amounts of sludge generated, creating an enormous disposal problem. John Todd and colleagues, as I mentioned, will be studying using moss species that thrive at mine sites to bioaccumulate metals to the point that they can be recycled by industry.*

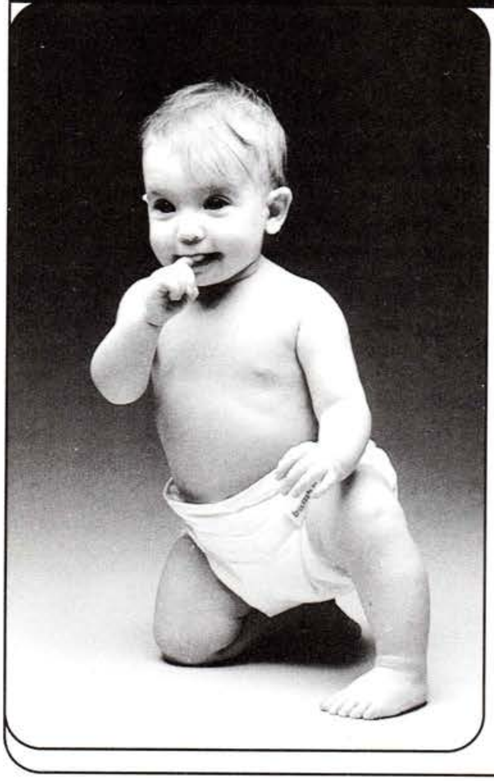
The long-term solution to the heavy metals problem, of course, is for industries to recycle them at the factory and for consumers to avoid products that contain them whenever possible – that's the only way they won't end up in municipal sewage or landfills. —*Janet Marinelli*

Our water district has an ultra-low-flush toilet-replacement ordinance, which goes into effect in 1990. Approximately 5,000 vitreous china toilets will be replaced each year. We would appreciate any information or suggestions as to disposal of the old high water-use toilets.

Lynn Hulme
Marin Municipal Water District
Corte Madera, Calif.

ADVERTISING BEEFS

Your editorial (November/December) on the acceptance of advertising makes some



The Better Solution

You'll change your baby over 7,000 times before toilet training is completed. That could mean a lot of disposable diapers added to our growing landfills. You know that using cloth diapers is the only true solution to the "diaper crisis". And cloth diapers also give your baby the pure natural comfort of cotton without the chemicals or rough feel of disposable diapers.

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Disagreement about degradability has diverted attention from the real issue. Americans need to understand that they must adopt practical, habit-changing actions, like recycling, to help solve the solid waste crisis.

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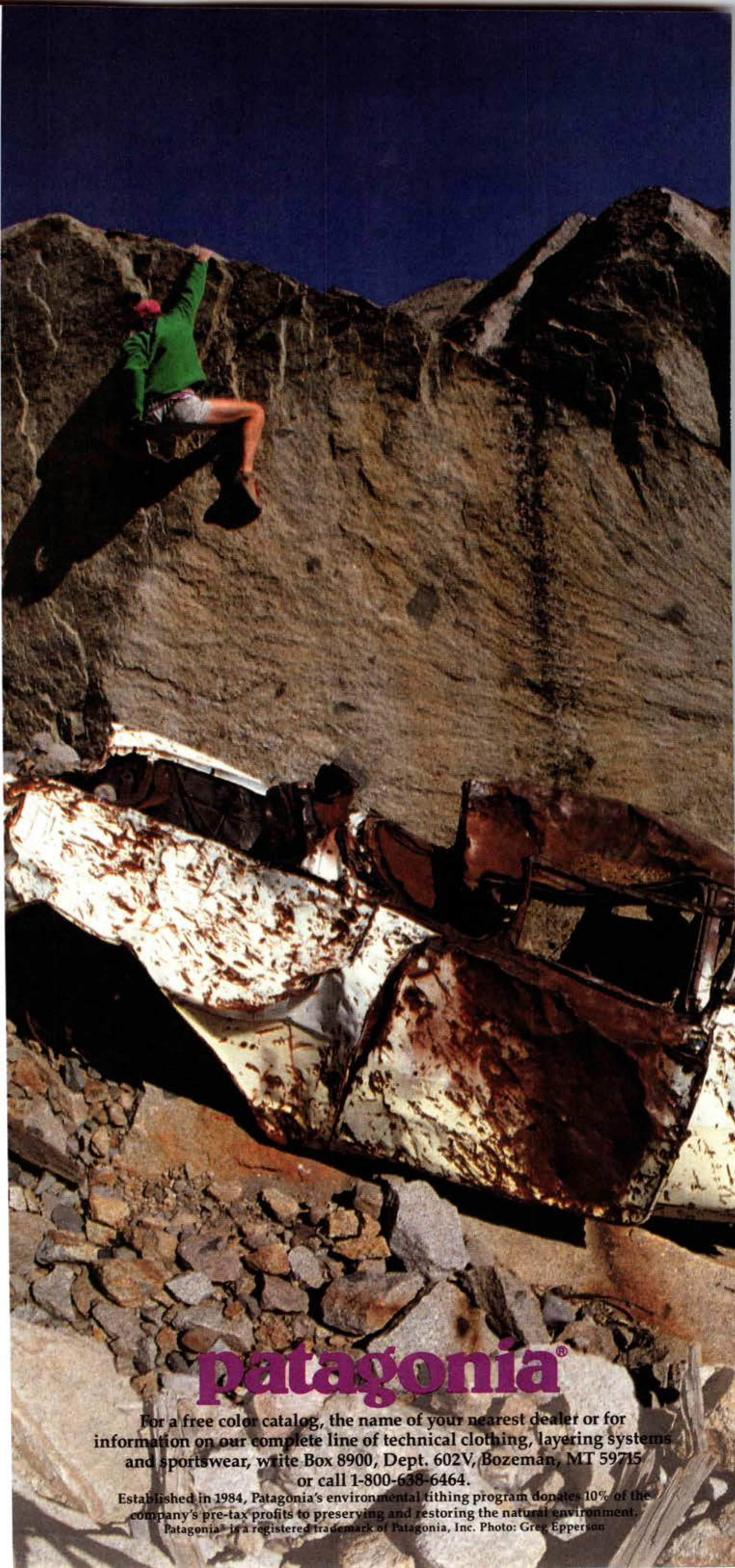

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sense. However, I'll feel a whole lot better about your acceptance of advertising from General Electric, for example, after you publish an article investigating their environmental record. I feel suspicious about your objectivity now that you accept advertising from a company that thrives off the proliferation of probably the deadliest kind of garbage: radioactive waste and fallout. I'd like a magazine that called GE to task and accepted their advertising, too. Maybe I'd even subscribe another year.

David Hutchison
Roseburg, Ore.

So far, we haven't done any investigative muckraking, preferring to commit pages to practical solutions and individual understanding. We wouldn't rule it out in the future, however. – the editors

I eagerly read **GARBAGE**, and it contained the kind of information that I am looking for. However, upon turning the front cover, I discovered that one of your largest advertisers is General Electric Corporation. If you are not aware of the boycott of GE called by the group INFACT, let me tell you why I signed the pledge:

1. GE makes more parts for more nuclear weapons than any other company.
2. GE makes the neutron "trigger" for every nuclear bomb.
3. GE is at least the third-largest producer of nuclear weapons systems in the world.
4. GE actively promotes the arms race with contributions and lobbying, despite popular support for a bilateral freeze and despite the threat to human survival posed by the 50,000 or so nuclear weapons already in existence.

In addition to the above, I feel angry that this company seeks to promote unquestioned its image of "bringing good things to life."

Ann Ward Kane
Alameda, Calif.

Thank you for an excellent magazine. I would, however, like to address a subject from your November/December issue. You came out in your editorial in defense of your stand on advertisers, using the KKK as an example of an advertiser whom you would consider "morally unethical." Am I to understand, then, that you consider producers of non-biodegradable plastics and killer chemicals "morally ethical"? These big corporations who keep pushing this stuff on us and polluting our planet are no better than the KKK! Regardless of your inferred disclaimers, by choosing this kind of material for your new magazine, you have taken a side, and therefore *are* a special interest group! You do need to screen advertisers if you want to maintain credibility.

Brian Francis
Friday Harbor, Wash.

A great number of our Letters to the Editor were written on word processors,

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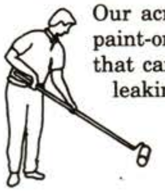

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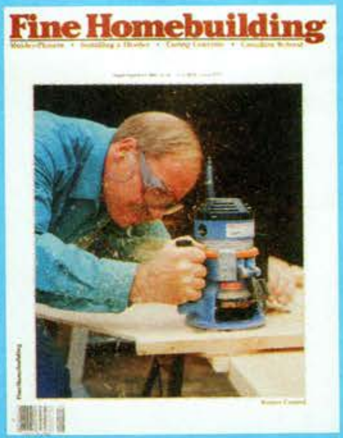

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which are made of "nonbiodegradable" plastic parts (often manufactured by GE) and which run on electricity produced by nuclear energy or fossil-fuel burning....

The issues are complex. — P. Poore

COMPOSTING

My November/December issue of **GARBAGE** was fascinating reading, but I do have one gripe. Throughout the articles, and especially the one about hot mulch bins, it seems to be assumed the readers are knowledgeable, experienced environmentalists. My most ardent ecological experience was helping pick up the trash in town for Earth Day '73. I was 16.

I feel kinda stupid asking this, but what is a compost heap good for besides a place to make garbage disappear? And what does he [author Robert Kourik] mean by "turning" the compost? I subscribe to **GARBAGE** because I lack any fundamental knowledge about conserving our resources. I'm an intelligent person, but I have to admit, compost heaps are over my head.

Richard Ricklefs
Saratoga, N.C.

ORGANIC FOODS

I was disappointed to read in your article "Organic Foods – Are You Getting What You Paid For" [Nov/Dec] your description of state certification programs. You leave out Vermont all together – a state that is being heralded as having one of the most supportive state/certification-group relationships of any. The certification is done by an independent inspector, but paid for by the Vermont Department of Agriculture. The Department of Agriculture also is actively involved in the promotion of Vermont Organic Certified products, and has provided funding for organic farmers to do on-farm research.

Enid Wonnacott
Richmond, Vermont

The Vermont Legislature has not adopted a definition of organic, thus Vermont didn't fit into the categories we used. – the editors

The opening paragraphs of the stories on composting and organic food in the November/December issue ... imply that all organic gardeners grow third-rate vegetables or that only a few old hippies still compost in the '80s — an insult to a large number of your readers.

We have been gardening organically and making lots of compost since '82, and plan to do so for many more years. Our soil and vegetables are superior to those grown chemically. (I put lots of "grocery-store-quality" vegetables in the compost pile, because we don't eat the

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GAR1

lower-quality produce from our garden.)

I realize that ours is not the average sub-division home, with our garden and compost bins, but we aren't as rare as you might think.

Julie Garrett
Scottsboro, Ala.

FALCONS

Your article on the recovery of the Peregrine Falcon on the rear cover of the November/December issue was noted with great interest here. As you observed, crucial to the species' survival was the banning of DDT. Our only observation was that the banishment of DDT was a direct result of Rachel Carson's 1962 publication of *Silent Spring*.

This is mentioned to keep alive the memory of Miss Carson, who is now recognized as the Mother of the Environmental Movement, and more importantly, as an example of what one person with courage can achieve.

Gerald P. Kruth
Vice-President, Rachel Carson Homestead Association
Springdale, Pa.

SUPER CITIES

As a newly relocated naturopathic physician in Great Falls, Montana, I am forced to wonder what measurement factors were used to decide the "Best and Worst Cities" to live in [*Lifting the Lid*, Nov/Dec]. Already in a few short months I have had to treat two patients who lived in Billings for years and are now suffering severely from exposure to the extreme amount of pollutants – most notably sulfur dioxide – in the Billings air. The knowledge of how industrial complexes thrive in Billings is enough to make me very much disbelieve your opinion that Billings is one of the best places to live. Please substantiate your claim.

Mona Morstein, N.D.
Great Falls, Mont.

The Urban Stress Test *report was published in 1989 by Zero Population Growth, which used federal data to analyze 192 U.S. cities for stress factors including environmental, economic, and social conditions. Air and water quality, sewage, and hazardous waste were assessed. The report is $4.95, ppd, from ZPG, 1400 16th St. N.W., Washington, D.C. 20036.*

THANKS

I am so thankful to you for creating this very positive magazine! Please promote yourselves lots (I will, too, by word of mouth), so your useful info and exposés, etc., really do reach people. My family has already found numerous practical tips.

Evan Matlock
Clearwater, Fla.

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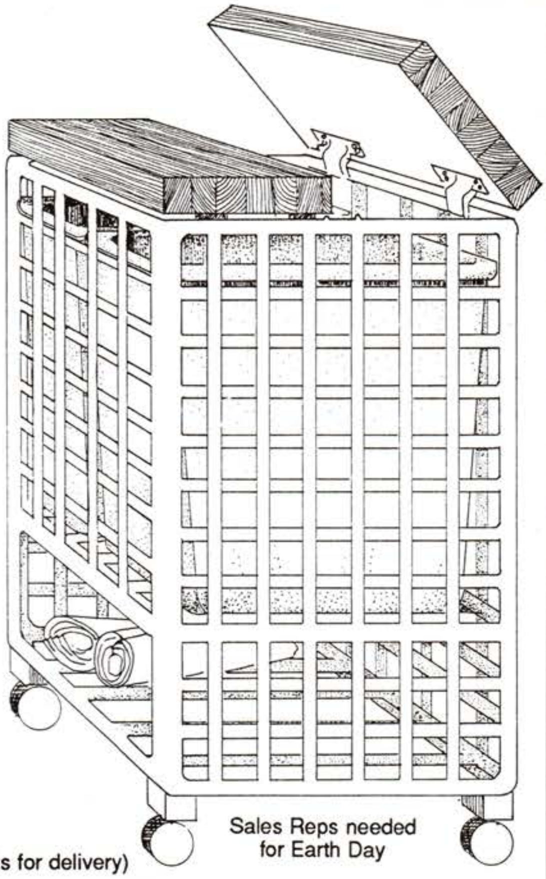

Sales Reps needed for Earth Day

A candid discussion about household hazardous waste

Whether or not we like to admit it, each of our homes probably contains numerous household hazardous waste items. In fact, it is estimated that the average household contains between ten and fifteen gallons of hazardous waste materials.

The potential dangers of carelessly storing and discarding household hazardous wastes are no secret. In an effort to prevent these wastes from finding their way into local sanitary landfills and water sources, many concerned citizen groups and city leaders are aggressively seeking ways to organize household hazardous waste collection programs.

GSX Chemical Services, Inc., is one of the nation's largest organizations committed to the effective management of household hazardous wastes. We create responsible community partnerships to educate people about the dangers of household waste. GSX has helped to organize, and has participated in, nearly two hundred hazardous waste collection programs across the country. GSX can help solve your household hazardous waste problem.

If your community is considering organizing a collection program, we encourage you to contact GSX at 1-800-845-1019. Our manager of household hazardous waste is available to answer your questions about conducting a waste collection program in your area.

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ASK GARBAGE

Q: *What kind of problems do laundry detergents containing phosphates pose in our waterways? Are there safer alternatives?*

Mary Sue Freer
Ann Arbor, Michigan

Does laundry detergent pollute?

A: Phosphates, oxygenated molecules of the element phosphorous, can trigger a dangerous chain reaction when they reach static or slow-flowing water bodies. (Rapidly moving water bodies flush out phosphates quickly.) Often used as an ingredient in powdered laundry detergents, phosphates also function as plant nutrient and fertilizer. Herein lies the problem. When phosphate runoff enters our waterways, it encourages the growth and multiplication of algae and other aquatic plants. Ultimately, the plants die and sink to the bottom, their decomposition depleting water of vital oxygen. As a result, fish and other animals may suffocate. If oxygen deprivation doesn't kill them, the proliferation of toxin-producing strains of anaerobic micro-organisms (the creatures that don't need oxygen to survive) just might.

Typical sewage-treatment plants are unsuccessful at removing phosphates from wastewater and sludge. But eight states (Ind., Md., Mich., Minn., N.Y., Vt., Va., Wis.), the District of Columbia, and several counties and municipalities in other states have restricted their use in laundry detergents, forcing manufacturers not to exceed a O.5-percent-phosphate level in their products. (Some of the states and some counties have also stipulated that dishwashing detergents contain no more than 8.7% phosphate.)

Most detergent manufacturers voluntarily label their products with information on biodegradability and phosphate content, which makes for easy comparison. Liquid detergents contain no phosphates.

Q: *I've heard that the process of dry cleaning clothes involves some nasty chemicals. Exactly how do dry cleaners get your clothes clean and what are the dangers of the procedure?*

Keith Blanchard
Ithaca, New York

A: The term "dry" cleaning is something of a misnomer. When you take your clothes to the cleaner, they are doused with a potent chemical solvent, most often perchloroethylene (PCE, also referred to as "Perc"), a suspected human carcinogen. PCE is a volatile compound, so it offgasses (or evaporates) into the air, potentially threatening the health of those who absorb or inhale it. Some household-hazardous-waste experts recommend that dry-cleaned clothes be unwrapped as soon as they are taken home and hung in a well-ventilated place for up to a week. Recognizing the dangers of PCE, the Occupational Health and Safety Administration (OSHA) in September reduced its exposure limit for workers who come in contact with PCE. OSHA concluded that no worker should inhale more than 25 parts per million of PCE in a work day – the previous limit was 100 parts per million.

Photos: Index Stock/Black Box

How safe is dry cleaning?

Not surprisingly, the environmental effects of PCE are as problematic as its health effects. Although it is a hazardous material, its disposal is often unregulated. Dry cleaners – small operations by Environmental Protection Agency standards – are exempt from that agency's hazardous-waste disposal guidelines. So, many facilities dump PCE down the drain where it can pollute waterways, or into the trash where it can leach through landfills into groundwater. In addition, PCE may be damaging to the ozone layer because of the chlorine it contains.

Try to dry-clean only those clothes that *absolutely* can't be laundered. When you do need a dry cleaner, look for one who uses naphthalene rather than PCE. Although it is a petroleum-based solvent, naphthalene is less potent than PCE.

GOT A QUESTION?

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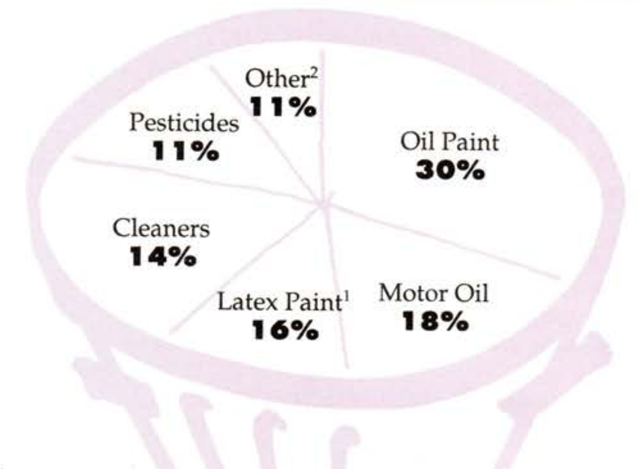
Household Hazardous Waste In The Municipal Waste Stream

Household-maintenance items[1]	**36.6%**
Household batteries	**18.6%**
Personal-care products[2]	**12.1%**
Cleaners	**11.5%**
Automotive-maintenance products[3]	**10.5%**
Pesticides, plus pet supplies, and fertilizers	**4.1%**
Hobby/Other[4]	**3.4%**
Pharmaceuticals	**3.2%**

[1] Mostly paint, plus thinners, adhesives
[2] Includes nail polish and remover, hair spray, deodorant
[3] Mostly oil
[4] Includes pool chemicals,lighter fluid, art supplies

(The Garbage Project, University of Arizona)

Types Of Household Hazardous Waste Brought To Collections



[1] Designated as hazardous waste in California
[2] Adhesives, antifreeze, asbestos, batteries, gasoline, hobby chemicals, home maintenance products, household batteries, paint thinners, pool cleaners, radioactives

(Dana Duxbury and Associates. Based on waste collected in seven randomly chosen events, which varied in size.)

Estimated Deaths Each Year From Exposure To Indoor-Air Pollutants[1]

Radon	**5,000-20,000**[2]
Second-hand tobacco smoke	**6,000**
Benzene	**460**
Five other suspected carcinogens[3]	**under 780**

[1] Due primarily to at-home exposure over the course of a lifetime
[2] Estimate based on mortality for smokers exposed to radon; the number of non-smokers estimated to die from radon exposure each year is 3,000
[3] Chloroform, carbon tetrachloride, paradichlorobenzene, tetrachloroethylene, trichloroethylene

(EPA and Air and Waste Management Association)

Expected Deaths in 1990 from Asbestos-Related Disease[1]

Lung cancer	**5,500**
Mesothelioma[2]	**2,600**
Other cancers	**1,500**

[1] Mostly from occupational exposure
[2] Primarily cancer of the lung's lining

(American Journal of Industrial Medicine)

Miscellaneous Facts

Pounds of hazardous waste generated in the average home each year[1]	**15**
Pounds per participant brought to household hazardous waste collection days[2]	**116**
Number of new pest-control chemicals registered with the EPA annually[3]	**10**
Number of new pesticide products introduced onto the market annually[4]	**2,200**
Dollars spent on indoor pest control annually[5]	**$1,500,000,000**

[1] *Dana Duxbury and Associates,*
[2] *Dana Duxbury and Associates. Data includes first-time collections, to which people bring years of accumulated wastes. One participant may represent more than one household.*
[3] *EPA*
[4] *EPA*
[5] *American Pest Control Association*

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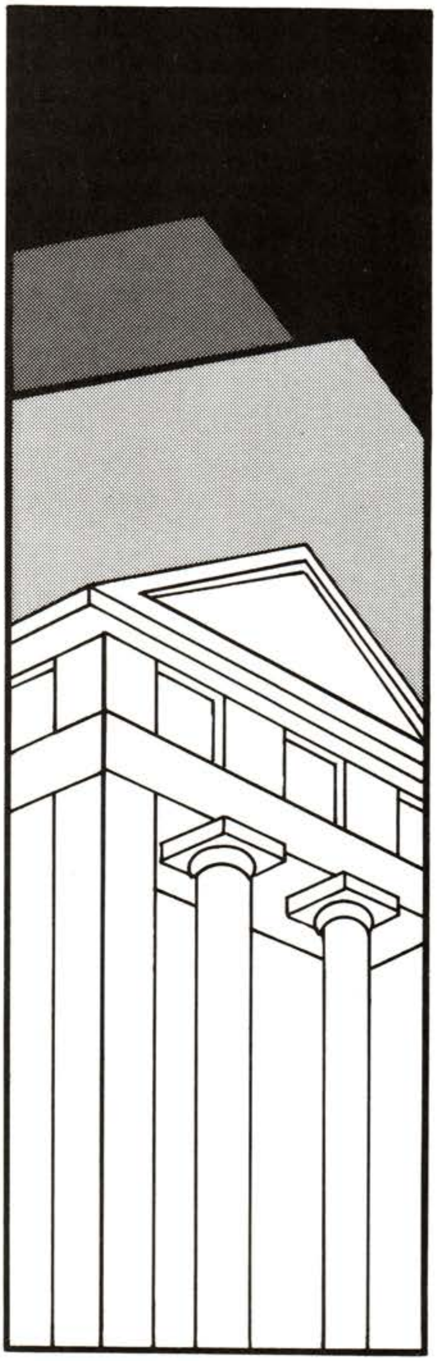

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GAR-3

FOR THE RECORD

"They're into deficit depletion, not ozone depletion."

Kevin Fay,
executive director of the CFC Alliance, criticizing Congress's new tax on the manufacture of ozone-destroying chloroflourocarbons, or CFCs. (*Washington Post*, Dec. 21, 1989)

"There's a whole section of the grocery store, the non-food section, where there's nifty things we could do."

Craig Warren,
a vice president of International Flavors and Fragrances, a New York company that has found a way to impregnate plastic packaging with scents that appear to influence consumers' buying behavior. (*Wall Street Journal*, Jan. 9, 1990)

"At this rate we will soon reach a point from which it will be impossible to recover our credibility"

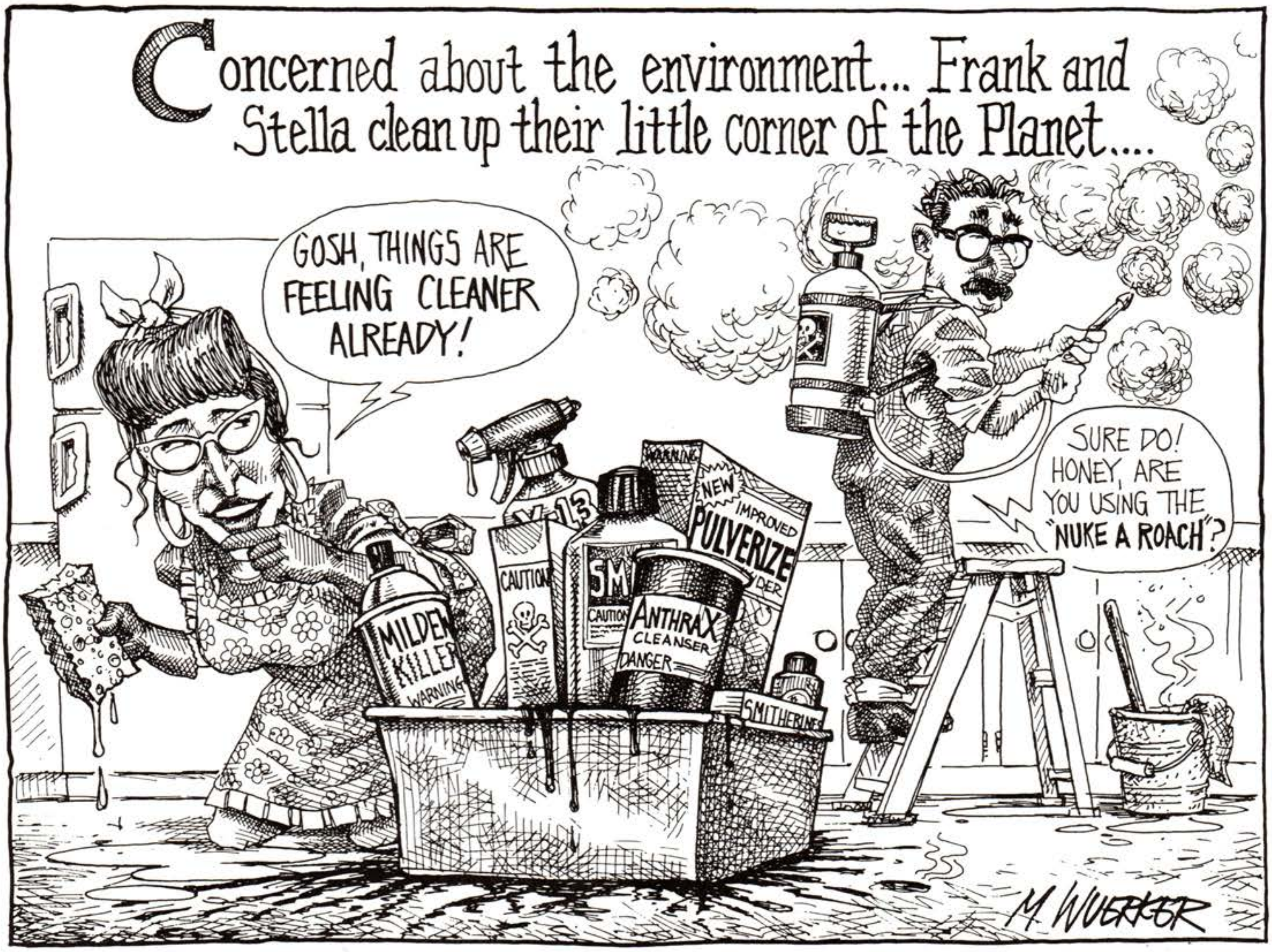
Larry Thomas,
president of The Society of the Plastics Industry, in a memo regarding the public's disenchantment with plastic. (*Washington Post*, Jan. 30, 1990)

PROFILE

"I find it amusing that you're talking about rubbish and art in the same breath," grinned Scottish sculptor David Mach, smoking a cigarette outside the Grand Lobby of the Brooklyn Museum. Inside, the lobby floor was littered with bright shreds of magazines. For days he'd been stacking 45 tons of magazines to form the five huge columns that were temporarily dominating the august space. The idea? To remind visitors that this bastion of high art is supported by pop culture.

Mr. Mach, 34, has been sculpting with society's leftovers for eight years. In 1989 he did a 160-ton set of magazine columns in Madrid, Spain, and a set of smaller ones for a SoHo gallery in New York City.

Why magazines? Although Mr. Mach would prefer that viewers figure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Matt Wuerker

that out themselves, he did give some hints. "Magazines are contemporary. They tell you all about your society, what you should look like, how successful you should be." Wherever he goes, David Mach finds publishers willing to donate tons and tons of unsold magazines. And wherever he goes, recyclers follow, with an eye toward whisking away the shiny sculptures to the nearest recycling facility when the exhibit closes.

Mr. Mach insists he's not really interested in the environmental concerns that cause recyclers to follow him like vultures. "I don't work with junk. I work with *extras*," he protests.

But he did confess that part of the point is to make people contemplate the gross overproduction in our economy – the waste – that makes his sculptures possible. The tons of leftover magazines he's given – *Esquire, Rock Scene, Vogue, Hustler* – are just "the tip of the iceberg." The tip of the *landfill*, you might say. And the sculptor did agree to pose for a photo by the museum's new recycling dumpster, a batch of *Esquires* featuring Tammy Faye Bakker's face under his arm.

The New York City Department of Sanitation not only cleaned up the pieces of magazine that Mr. Mach discarded while creating "A Hair's Breadth," but will recycle the magazines when the exhibit ends. David Mach admitted there's something, well, humbling about working so close to a recycling bin that hungrily awaits the demise of his exhibits. "It keeps you down in the realm of reality," he said with his Scottish lilt. "Otherwise you'd be out there with the fairies."

– Hannah Holmes

GARBAGE DICTIONARY

toxic terrorist, *noun (singular).* One who fans "chemophobia, or fear of chemicals, among the masses." That's how the *Wall Street Journal* defined the term in a November 1989 story about the waning popularity of roach-killing pesticides. But apparently the term was first deployed by Dr. Elizabeth M. Whelan, president of the non-profit American Council on Science and Health, responding to what she calls the "carcinogen of the month club" in *The Toxic Terrorist* (1985).

Toxic terrorism began in earnest in 1959 with the Great Cranberry Scare, according to Dr. Whelan. An herbicide used on cranberry bogs was accused of causing cancer, resulting in a Thanksgiving without the traditional tangy sauce. Toxic terrorism picked up speed in the '60s with the publication of Rachel Carson's *Silent Spring*, which documented the deadly effects of pesticides including DDT.

Toxic terrorists "throw grenades and watch them explode," says Dr. Whelan. "The most recent was the Alar grenade." She maintains that no scientific evidence links Alar with health problems in people of any age and that toxic terrorism results in terrified consumers, not healthy food. "Nature is not benign to people who reject modern technology," she says.

How are toxic terrorists recruited? Not in any organized way, and probably not with any malice. Increasingly popular books like *The Nontoxic Home, Nontoxic and Natural*, and *The Healthy Home* scare people with their compiled lists of hundreds of toxins used in homes. Media people jump on a story that's juicy precisely because it panders to public hysteria.

Americans are becoming increasingly wary, if not deathly afraid, of synthetic chemicals. While an advertisement for one brand of household pesticide depicts bugs fleeing the deadly can, lately some *consumers* are turning tail and running. Toxic terrorism may help us turn away from unnecessary risks. But it can cloud issues and misdirect our energy, too. *— Hannah Holmes*

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COMBATTING HOUSEHOLD PESTS WITHOUT CHEMICAL WARFARE

BY ROBERT KOURIK

On the seventh day God rested, but according to some, the Devil was busy making pests — pests with many legs, pests with furry coats, pests that buzz through the air. In the grand scheme of things, all creatures have a purpose. After turning on the kitchen light at three in the morning to see cockroaches swarming over the toaster, you might ask what in heaven's name is the grand purpose of the roach? Well, for one thing, the insect is very creative at exploiting other creatures' castoffs (such as the crumbs left in a sloppy heap at the base of your toaster). Without roaches and other efficient decomposers, we would have been buried under life's refuse long ago. In fact, nature has such a need for them that she (or he or it) has seen fit to evolve thousands upon thousands of these biological recycling factories.

All right, so you still want to exterminate the vermin. We Americans are so repulsed by the sight of roaches and other pests darting for cover that we skip all moderate pest-control measures and go straight for the "neutron bomb of pesticides" — the most noxious, toxic compound which destroys the enemy but leaves the building intact. Yet, while TV commercials make extermination look perfectly safe, the chemicals routinely used are often quite dangerous and potentially harmful to you and your family.

You *can* control indoor pests without endangering your loved ones by using a series of common-sense steps collectively called integrated pest management (IPM). IPM begins with a close look at the environment and lifestyle of the creature, and takes steps to eliminate its habitat and disrupt its lifestyle. If chemical controls are needed, the least-poisonous botanical or synthetic pesticide is judiciously chosen and used at the most vulnerable period in the pest's life cycle.

IPM admittedly is more labor-intensive than reaching for the "Kills All" bug bomb. Eliminating a pest's habitat by keeping the kitchen spotless and caulking holes in the walls takes considerably more effort than reaching for a toxic spray. And note that the term IPM includes the word "management," not "control." Most pests are too shrewd, too adaptive to be out-and-out eradicated. At best, they can be managed so as not to present a problem in the home. But at least with IPM your family's health won't be compromised.

There's another good reason to avoid many commonly used pesticides: The bugs are becoming resistant to them. The U.S. Environmental Protection Agency estimates that farmers use 12 times more pesticides than they did 30 years ago, yet crop losses before harvest have doubled, due in part to insects' developing resistance to the chemical compounds.

So how do you go about managing household pests with IPM?

First, *monitor the situation*. Be on the lookout for potential problems before they become full-blown epidemics. With most indoor pests, the problem is obvious right off the bat: You turn on a light late at night and see the roaches scurry. Sacks of beans in the pantry have the telltale holes made by little mice mouths. That first itch around the ankles is a giveaway that Fido has brought in fleas again.

Next, *evaluate the extent of the problem and whether action is necessary*. In the fancy language of IPM this is called "setting injury and action thresholds." With roaches, the answer is easy — one is too many! Like roaches, most household pests are intolerable at any population level. A homeowner is much more likely to tolerate, for example, a handful of caterpillars on a shady tree – outdoors.

Identify the enemy. Although all cockroaches seem alike, there are four major types: German, brown-banded, Oriental, and American. If you're in doubt, take a sample roach to your local Cooperative Extension, a pest-control company, or an entomologist for precise identification. This may not seem important, but it does influence which roach trap to choose (see page 24 for details). Sometimes, of course, identification is not as critical; a mouse, for all practical purposes, is a mouse.

The next step is to *learn about the life cycle of the pest, its habits, how it feeds, and where it sleeps, mates, and hides*. Remember, this is war, so study the enemy carefully to determine what kind of assault will do the most damage, and when. For instance, while roaches can smell and avoid most insecticides, they can't easily smell boric acid. If you sprinkle boric acid in places where roaches travel or hide, they'll walk through it and the dust will stick to their legs. Roaches, believe it or not, like to clean themselves. They ingest the boric acid while "grooming" and slowly die in a week or two.

Begin with non-chemical weapons. Two premier IPM tools are "habitat modification" and "harborage reduction or elimination." This simply means disrupting or eliminating the places where the pests enter the home, travel, or hide, and getting rid of the food or water that attracts them in the first place.

The next escalation in tactics, at least against some pests, is to *use non-toxic traps*. Whether they're called "roach coaches" or "ant motels," the objective is the same: to trap the pesky creatures in a mini-chamber of goo. Thanks to your covert intelligence on roach habits, for example, you know it's best to set out the traps in enclosed, dark places and along the perimeters of walls.

Chemical warfare should start with the least poisonous substances. Every household pesticide has an LD_{50} rating which can help you judge its relative toxicity. An LD_{50} is the single dose (in mg per kg of body weight) which, when administered to laboratory test animals, killed 50 percent of the population. LD_{50}s are determined for oral exposure to a pesticide and absorption through the skin. Pesticides with very high LD_{50}s (5000 mg/kg and above) are relatively non-toxic. Pesticides containing chemicals with oral LD_{50}s between 0 to 50 mg/kg can be highly toxic. To determine the LD_{50} of any commonly sold pesticide, you can call the National Pesticide Telecommunication Network at (800) 858-7378. (You don't even have to be able to pronounce the chemical's name or know the active ingredient; they can look it up by the product's trade name.)

The Armageddon of pest controls, *bug bombs and poisonous chemical sprays should be used only as a last resort*. Consider Raid Ant and Roach Killer. Its major chemical component is 2-(1-methylethoxy) phenol methyl carbamate. This chemical attacks the nervous system. With an oral LD_{50} of 95, the active ingredient in Raid is virtually as toxic as DDT and 28 times as toxic as boric acid. (Boric acid, with an LD_{50} of 2660 mg/kg, is still a poison to be treated with respect. Ingestion of as little as one tablespoon could kill a child.)

What's more, Raid is far from selective about the creatures it kills. It is a spray which the manufacturer claims is effective against "roaches, palmetto bugs, water bugs, crickets, centipedes, silverfish, firebrats, scorpions, spiders, ants, clover mites, sowbugs, earwigs, flies, mosquitoes, gnats, wasps, paper nest and mud dauber wasps, and brown dog ticks." By comparison, boric acid, a milder broad-spectrum pesticide, is a powder which, when properly applied, is not inhaled by untargeted creatures — like you and your family.

Now let's take a look at a lineup of some of the most common household pests, their MOs (methods of operation), and tips on how to control them — listed in order from the least to the most toxic, with an emphasis on safer biological methods. Many thanks to the Bio Integral Resource Center, a leader in the real-world application of IPM techniques, and director Sheila Daar for her enormous assistance in preparing this guide to integrated pest management at home.

Arthur "Bugsy" Ant

Also know as *Monomorium pharaonis* (the common household ant) and *Solenopsis invicta* (the imported red fire ant).

Last known address: the kitchens and lawns of America.

Crimes committed: Loitering around sinks, refrigerators, countertops, and gardens.

MO: Household ants often show up just before a rainy spell, and travel in battalions in sinuous lines throughout the house in pursuit of good-tasting stuff. Fire ants stay outdoors and are usually harmless, but inflict nasty bites when disturbed or harassed.

Distinguishing features: Black, brown, or reddish; move around compulsively in long lines; eat a lot.

Means of control:

- Be fastidious in the kitchen. Clean up all sources of food. Tightly seal all stored food.
- Keep bowls of food and water for pets as empty and clean as possible.
- Fix all drips, as they provide moisture, which ants love.
- Caulk and seal all cracks in the walls and foundations, which are being used as points of entry.
- You may have luck with one or more old-fashioned organic remedies, including: lining points of entry into the house with powdered bone meal, charcoal, and cayenne pepper; squirting lemon juice at the point of entry; leaving lemon peels where ants have been seen entering the house; scattering mint or pennyroyal around your shelves; and planting tansy (beware — this very invasive herb can become a plant pest) or mints near the doorways. While I've never had much success with these methods, they are fairly innocuous.
- Sprinkle boric acid where ants have been known to enter the house. They clean the boric acid, a stomach poison, off their bodies, and die. (Remember to keep boric acid away from pets and children. Use it only in concealed, out-of-the-way places.) Boric acid is effective for up to one year if it remains a loose powder. Replace it only when it cakes up or is all used up. The boric acid sold in pharmacies does not have an anti-caking agent, so is not as effective. Insecticidal boric acid (with anti-caking agents) is available from suppliers listed at the end of the article. Be sure to read the label; one product (Antrol, 2 percent boric acid) includes formaldehyde, a suspected carcinogen, as an "inert" ingredient.
- Pyrethrins, botanical insecticides derived from chrysanthemums, combined with silica gel have been shown to be effective in controlling ants within a few days. Note that one aerosol version (Revenge) contains the chemical synergist piperonyl butoxide, whose toxicity has not been fully studied.
- Fire ants have been successfully controlled with a parasitic mite available from some suppliers specializing in beneficial insects. (See sourcelist on page 26.)
- If you decide to use "ant stakes" (metal chambers that contain an attractant mixed with an insecticide, to be placed at regular intervals along the foundation of the house or inside), use them with caution, as they utilize deadly arsenic. The ants carry the poison back to the colony, where even more ants are killed. While quite effective, ant stakes *must* be kept away from water and rain so the poison doesn't leach into the soil or poison fish in waterways, and they *must* be kept hidden from pets, wildlife, and children as *there is no antidote for arsenic poisoning*.
- Other ant killers use even more toxic ingredients. Read the labels carefully and treat them as the deadly poisons they are.

Illustrations by Richie Moseley

Ralph "The Repulsive" Roach

This sneaky character can be one of four common varieties: the German roach (*Blatella germanica)*, the brown-banded roach (*Supella longipalpa*), the Oriental roach (*Blatta orientalis*), and the American roach (*Periplaneta americana*)

Last known address: Under the sinks, in the fridges, on the countertops, and across the kitchen floors of homes from coast to coast.

Crimes committed: Pilfering of crumbs, water, and bits of food and generally terrorizing innocent, God-fearing Americans.

MO: Slinks under cover of darkness. Likes to pass through narrow passages where both the upper and lower parts of his body are touching something (a propensity called "thigmotaxis") — in other words, the roach likes cracks and isn't claustrophobic.

Distinguishing features: Brown or black wings folded above a thin abdomen, six legs, and long antennae.

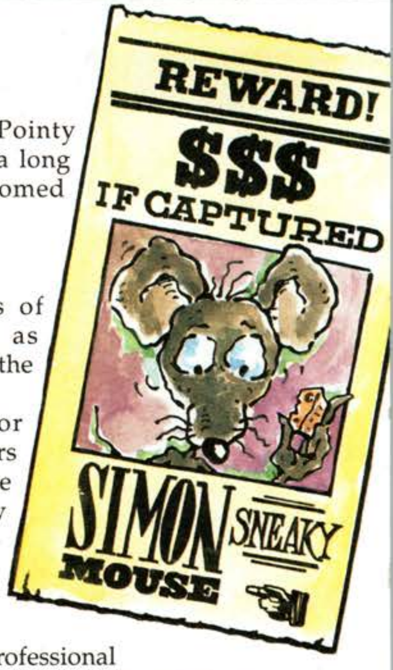
Caution: Carriers of *Salmonella*, *Toxoplasma*, and hepatitis B virus.

Means of control:

- Be a fastidious housekeeper! Keep all food properly sealed. Clean all surfaces, walls, floors, and corners frequently. Leave no crumbs as enticement for late-night snacks.
- Take out the trash often.
- Recycle as many empty beverage and food containers as possible and take the rest to the trash can — often.
- Fix all leaking pipes and faucets, which attract roaches.
- Don't leave pet food or water bowls full overnight.
- Keep litterboxes clean.
- Vacuum up all "evidence" (the polite word for the minute, pepper-like roach feces) of their activity. Then caulk, weatherstrip, and seal all cracks where you've vacuumed. Begin where there was the most "evidence." Also, seal or screen all possible entries into the house: in eaves, around

Simon "Sneaky" Mouse

Also known as *Mus musculus* (the house mouse).
Last known address: In the pantries, kitchens, attics, walls, and basements of many American homes.
Crimes committed: Snooping around and pilfering food, making holes in walls, and scaring the livin' daylights out of otherwise rational people. Known for indiscriminate acts of terror — such as popping out of a bag of dog food just as you're about to reach in.
MO: Enters surreptitiously through a weak defense, notably cracks and holes in the floor and walls.



Distinguishing features: Pointy pink nose, cute little ears, a long tail, and a small, well-groomed furry body.

Means of control:

- Follow the same rules of fastidious housekeeping as described for the roach and the ant.
- Use only glass, metal, or *very* sturdy plastic containers to store food, as these persistent critters can chew through many plastic containers and all paper bags and cardboard boxes.
- Caulk and seal even the smallest holes, as these are professional pests capable of squeezing through even the tiniest opening.
- Be sure the weatherstripping below each door forms a tight seal with the sill plate.
- Doublecheck where pipes and wires enter the house and seal any openings or cracks. You may have to add metal flashing to frustrate the rodents.
- Make sure the foundation air vents are fully screened.
- Mice commonly enter walls via the gap between floor joists and wall studs. Fill this space with 2x4 wooden stops or a piece of sheet metal cut to fit the hole.
- Adopt a cat (then turn to the section on fleas).
- Trap all mice remaining in the house. My favorite bait for a spring-loaded trap is peanut butter, because it sticks to the trap, so the mice can't steal the bait without tripping the catch. Traps are a hazard to children and pets, so put them in an out-of-the-way place.
- Those who feel guilty about using spring-loaded traps, which break the creatures' little necks, should consider the Plastic Mouse Havahart and the Trap-Ease Mouse Trap. These humane traps catch offenders but don't kill them. You take the trap far away from home, release the mouse, and reuse the trap.
- The problem with all conventional mouse traps is that they catch only one mouse at a time and need frequent "cleaning" (disposal of the dead mouse) to be effective. I've heard of but haven't tried the following: Take a straight-sided, metal bucket, fill it halfway with water, cover the top with a stiff piece of paper with an "X" cut in the middle, and suspend a piece of cheese over the X several inches above the paper cover. When the mouse ventures across the paper to get the cheese, it falls through the X to the water below. Because the sides are slick and very vertical, the mouse eventually drowns.
- Another type of trap, called Got'cha by the manufacturer, consists of rigid cardboard strips coated with a thick sticky goo which grabs the pesty rodents by all fours. The drawback is that you're face-to-face with a quagmired but fully alert, albeit terrified, mouse, which you still must do in.
- A number of popular, widely available mice baits contain an anticoagulant, warfarin. The mouse eats some of the bait, becomes thirsty, (theoretically) leaves the house to seek water, and slowly bleeds to death internally. The big question is whether or not the mouse leaves your house. If not, you and your family will detect an increasing stench as

pipes and electrical lines, exhaust and air vents, window air-conditioners, doors, windows, etc. No easy chore.

- Clean up the roach's favorite outdoor hangouts: Remove debris and garbage. Move firewood and trash cans away from the house. Keep the yard free of pet excreta.
- Place poison-free roach traps where you suspect roaches previously entered the home. Traps may not catch all of the invaders, but will tell you how well you've done in bolstering your front-line defense of caulking, sealing, and screening. In one study, the D-Con trap caught mostly the German roach; the RoachCoach was inconsistent in its trapping abilities; and Mr. Sticky was the least effective. The best trap studied, catching significantly higher numbers of several types of roaches, was the Roach trap.
- Pyrethrins combined with silica gel have been shown to be effective with cockroaches as well as ants. See the section on ants.
- Place a boric acid dust in and along cracks that you suspect still harbor these critters of darkness. Be sure to put the powder where pets and children can't reach it. If you blow the powder into hard-to-reach places, wear a mask and goggles. Boric acid can also be absorbed through lesions in the skin, so protect yourself accordingly. Make sure any leftover powder is properly labeled and kept out of harm's way.

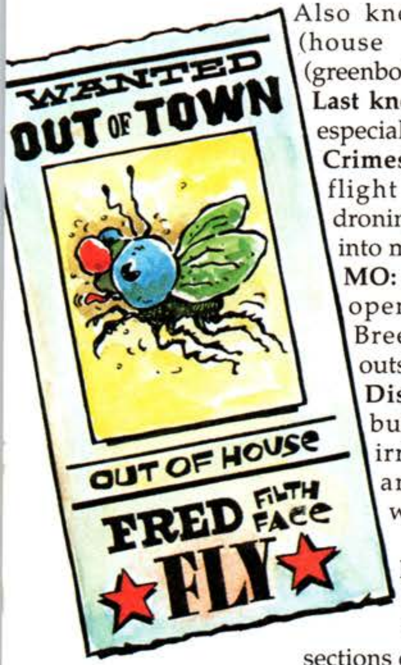
In one study, boric acid outperformed diazinon, Baygon, Drione, borax, pyrethrins, and sodium chlorosilicate against roaches. The researchers determined that boric acid was superior because it had a less noticeable smell than the other chemicals. In another study, after a single application of boric acid, roaches were "substantially controlled within approximately two months and completely controlled within nine months." Cockroaches have yet to develop resistance to boric acid after 10 years of continuous use.

- Borax, the washing powder, is a less expensive alternative to boric acid. While somewhat less effective than boric acid against roaches (borax killed 74.5 percent of the roaches in the study described above, while boric acid killed 93.1 percent), borax is about 30 percent cheaper. And in the same study, borax outperformed all but boric acid, including the synthetic chemical pesticides. Borax takes about four to seven days to do in roaches.
- Other roach killers contain more toxic ingredients. Read the labels carefully, and use with caution! These are not the innocuous allies they're portrayed as being in television commercials.

the creature(s) slowly rot, hidden within the walls. Furthermore, some of these baits come in a bright blue color, making them even more attractive to curious youngsters. This poison is rated as Class II or III chemical with a LD_{50} of 3 mg/kg. All baits should be safely hidden from children and pets. Another drawback: Unrestricted use of warfarin leads to resistant mice; in one study published in 1982, 75 percent of the mice tested were resistant to the anticoagulant.

- [Sonic warfare — Electric, ultrasonic wave-emitting devices are sold to "annoy" rodents away. About the size of an electric pencil-sharpener, they're cheap to operate and non-toxic. (Dogs and cats are unaffected.) We know of three cases of persistent mouse problems that were solved by these devices. — the editors]

Fred "Filth-Face" Fly



Also known as *Musca domestica* (house fly), *Phaenica sericata* (greenbottle fly).

Last known address: Your kitchen, especially after guests arrive.

Crimes committed: An irritating flight pattern, an incessant droning sound, and eggs that turn into maggots.

MO: Clandestine entry through open windows and doors. Breeds in filth and manure outside.

Distinguishing features: Big buggy eyes, black or irridescent bodies, six legs, and translucent, veined wings.

Means of control:

- Clean up the house thoroughly! Review the sections on ants, roaches, and mice.
- Take your compost bucket out to the compost pile or worm bin often and rinse it well afterwards. If you don't have an active, hot compost pile, bury the kitchen scraps deep within the pile, or cover them with a thick layer of sawdust.
- Make sure all windows and doors have secure screens with no holes.
- Flies love to breed in garbage cans. Keep your cans clean and the lids well-fitted. Failing that, bag and tie or wrap your garbage securely.
- Clean up and dispose of all dog feces on a frequent or daily basis. Dog manure can be composted in a thermophilic (hot) compost pile, providing the dog is free of worms. Clean litter boxes frequently. Cat feces should go directly to the dump.
- In rural settings, manure piles breed billions of flies. If this is a problem, you can manage the fly population using five commercially available parasitoids, parasites of fly pupae (the developmental stage between larvae and adult insects). For more information, see "The IPM Practitioner," Volume VII, No. 6/7, June/July 1985. (You can get the

SUPPLIERS

For More Information

The best source of information on integrated pest management at home is the Bio Integral Resource Center, PO Box 7414, Berkeley, CA 94707. Ask for the 12-page pamphlet entitled "Least-Toxic Pest Management Publications Catalogue" and include $1 for postage. BIRC also publishes two outstanding quarterlies: ***Common Sense Pest Control Quarterly*** (for the homeowner and gardener), $30 per year for individuals and $35 per year for families; and ***The IPM Practitioner*** (for the professional), $25 per year for individuals and $50 per year for institutions and businesses.

Suppliers

The following companies offer a range of natural and less-toxic pesticides, traps, beneficial insects, and environmentally sound pest controls.

Harmony Farm Supply
PO Box 460
Graton, CA 95444
(707) 823-9125
Catalog, $2

Peaceful Valley Farm Supply
PO Box 2209
Grass Valley, CA 95945
(916) 272-4769
Catalog, $2

Necessary Trading Company
8311 Salem Ave.
New Castle, VA 24127
(703) 864-5103
Catalog, $2

Natural Gardening Company
217 San Anselmo Ave.
San Anselmo, CA 94960
(415) 456-5060
Free catalog

Brody Enterprises, Inc.
9 Arlington Place
Fair Lawn, NJ 07410-3506
(800) 458-8727
Free catalog

Gardens Alive!
PO Box 149
Sunman, IN 47041
(812) 623-3800
Free catalog

Growing Naturally
149 Pine Lane
PO Box 54
Pineville, PA 18946
(215) 598-7025
Free catalog

Hydro-Gardens
PO Box 9707
Colorado Springs, CO 80932
(800) 634-6362; in CO (719) 495-2266
Free catalog

IFM
333 Ohme Gardens Rd.
Wenatchee, WA 98801
(800) 332-3179
Free catalog

Natural Farm Products, Inc.
Rte. 2, Box 201 A, Spencer Rd. SE
Kalkaska, MI 49646
(616) 369-2465
Free price list

Nature's Touch
11150 Addison St.
Franklin Park, IL 60131
(312) 455-6900

Pest Management Supply Co.
PO Box 938
Amherst, MA 01004
(800) 272-7672
Free catalog

Boric acid:

Organic Control, Inc.
(Ant-e-Roach)
5132 Venice Boulevard
Los Angeles, CA 90019
(213) 937-7444

Copper Brite, Inc.
(Roach Prufe)
1482 East Valley Rd., Suite 29
Santa Barbara, CA 93108
(805) 565-1566

R-Value/Redzone
150 N. Santa Anita Ave., Suite 300
Arcadia, CA 91006
(818) 798-4000

Upjohn
7000 Portage Rd.
Kalamazoo, MI 49001
(616) 323-4000

U.S. Borax
412 Crescent Way
Anaheim, CA 92801
(714) 490-6000

Fire ant parasitic mites:

Biofac
PO Box 87
Mathis, TX 78368
(512) 547-3259
Free price list

Kunafin Trichogramma Insectaries
Rt. 1, PO Box 39
Quemado, TX 78877
(512) 757-1181
Free catalog

MORE ON TERMITES

The **Bio Integral Resource Center** publishes a booklet which includes articles on sand barriers, liquid nitrogen and heat treatments, and nematodes. The booklet costs $11.85 ppd. Write BIRC, PO Box 7414, Berkeley, CA 94707.

Nematodes:
The following companies will direct you to pest-control operators who use nematodes to control termites. N-Viro will also instruct operators.

BioLogic
18056 Springtown Rd.
P.O. Box 177
Willow Hill, PA 17271
(717) 349-2789

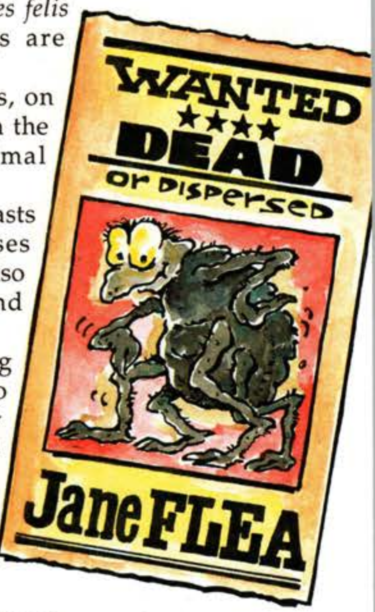
N-Viro Products Ltd.
610 Walnut Ave.
Bohemia, NY 11716
(516) 567-2628

Tallon Termite and Pest Control
1949 East Market St.
Long Beach, CA 90805
(800) 523-5360; (213) 422-1131

publication from the Bio Integral Resouce Center. See page 26 for the address.)

- Jar fly traps can help reduce the populations outdoors. Flies get in through an opening in the lid, but they can't get out. Place some fresh, uncooked meat or fish in the jar, cover half the bait with water, put the lid on, and hang near the suspected source of flies or near the patio. Keep the bait moist. Empty all but an inch of the jar when about three-fourths full; the one-inch layer of dead flies becomes the new lure.
- In the house, go back to the basics: Get a sturdy fly swatter. Then hold a contest to see who can smash the most flies.
- Consider hanging old-fashioned non-toxic fly strips. They do have one drawback: Flies naturally hover around the middle of rooms, and sticky strips are rather awkward suspended in the middle of the living room or dangling over the dinner table.
- Ultraviolet, electrical fly "zappers" are effective at attracting and electrocuting flies and other insects, including beneficial ones. The big drawbacks are the round-the-clock energy consumption and the irritating sound of flies sizzling when they hit the current.
- Some household fly sprays rely on Deet — a repellent, not a pesticide — with an oral LD_{50} of 2000 mg/kg. Others, such as Black Flag House and Garden Insect Killer, contain two types of synthetic pyrethroids: resmethrin and allethrin, with oral LD_{50}s of 4240 mg/kg and 920 mg/kg, respectively.

Jane Flea, aka "Jumpy"



Also known as *Ctenocephalides felis* (the cat flea — most dogs are hassled by cat fleas).

Last known address: In rugs, on pets and in their beds, and on the ankles of unsuspecting animal lovers.

Crimes committed: These beasts suck blood! Their bite causes annoying itching. They can also carry the bubonic plague and typhus.

MO: Jump onto unsuspecting animals and get a free ride into your house. Live off not only fresh blood, but also dried blood, hair, and skin. The pupae (the growth stage between larvae and adult insects) can remain dormant for up to six months.

Distinguishing features: Tiny head, large oval body with a thin, hard brown shell, powerful legs.

Means of control:

- Get rid of your pets (only kidding).
- Make kitty and pooch live and sleep outside.
- If the first two suggestions are unacceptable, keep your pets religiously clean. Brush their coats often — outside — with a flea comb. Wash them often and use a safe, mild insecticide that kills on contact, such as Safer Flea Shampoo for Cats and

Cockroach lures and traps:

Brody Enterprises
see above

Copper and metal barriers for rodents:

Allen Special Products, Inc.
(Stuf-Fit)
PO Box 605
Montgomeryville, PA 18936
(800) 848-6805

In-Tex Products, Inc.
(Guard-All mesh)
PO Box B, 11134 Lake St.
Cleveland, NY 13042
(315) 675-8471

Rodent traps:

Woodstream Corp.
(Victor Holdfast)
69 N. Locust St.
Lititz, PA 17543
(717) 626-2125
Free catalog

Hadley Products
(Trapper)
100 Products Ln.
Marietta, OH 45750
(800) 848-9106

Sticky glue boards to trap mice and rats:

Stone Chemical Laboratories, Inc.
(Got'cha)
467 North Aberdeen St.
Chicago, IL 60622
(312) 733-6554
Free catalog

Woodstream Corp.
see above

Humane traps:

Tomahawk Live Trap Co.
PO Box 323
Tomahawk, WI 54487
(715) 453-3550
Free brochure

Woodstream Corp.
see above

Fly traps:

Baley's
4227 Butterfield Rd.
Hillside, IL 60162
(312) 544-1850

Beneficial Biosystems
PO Box 8461
Emeryville, CA 94662
(415) 655-3928
Free brochure

Olson Products
PO Box 1043
Medina, OH 44258
(216) 723-3210
Free price list

Safer, Inc.
189 Wells Ave.
Newton, MA 02159
(800) 423-7544
Free catalog

Flea combs:

Otherways
2421 Prince St.
Berkeley, CA 94705

Breeders Equipment Co.
Box 177
Flourtown, PA 19031
(215) 233-0799

Petco Animal Supplies
9151 Rehco Rd.
San Diego, CA 92121
(619) 453-7845

Flea sprays:

Otherways
see above

Safer, Inc.
(Fleaguard and Flea Shampoo)
see above

Insect growth regulators for fleas:

Zoecon
(Precor and Precor 1%)
12005 Ford Rd., Suite 800
Dallas, TX 75234
(800) 527-0512

Pyrethroids for fleas:

3M Corp.
(Sectrol)
PO Box 3322
St. Paul, MN 55133
(612) 733-1110

Pyrethrum Powder:

Safer, Inc.
(Garden Insect and Fleas Killer)
see above

Ringer Corporation
(pyrethrum and silica gel products)
9959 Valley View Rd.
Eden Prairie, MN 55344
(612) 941-4180
Catalog, $1

Pristine Products
(Fossil Flower)
2311 E. Indian School Rd.
Phoenix, AZ 85016
(602) 955-7031

EcoSafe Products, Inc.
(Natural Animal Flea Powder)
PO Box 1177
St. Augustine, FL 32085
(800) 274-7387
Free catalog

Sand Barriers and Heat Treatments:

Isothermics
PO Box 18703
Anaheim, CA 92817
(714) 778-1396
Trains and licenses pest-control operators in constructing sand barriers to prevent subterranean infestations; will direct you to licensed operators.

Electroguns:

Etex Ltd.
916 S. Casino Center
Las Vegas, NV 89101
(800) 543-5651
Electroguns must be used by a technician trained in their use. Contact Etex for a qualified company.

Liquid Nitrogen:

Tallon Termite and Pest Control
see above

Dogs, made of potassium salts of fatty acids from soap.

- Wash all pet bedding often. Thoroughly vacuum around their beds. Take loose rugs to the cleaners, steam clean fixed rugs, and meticulously vacuum all floors.
- Rugs and floors can be sprayed with Safer Indoor Flea Guard. Vacuum thoroughly about 30 minutes after spraying. Thoroughly empty the vacuum cleaner — outside — after each use, wrap tightly, and place in the trash. Repeat this procedure every two weeks during the flea season.
- One new development in flea control is the use of insect growth regulators, available in liquid form or fogger sprays to use around the house. According to the Bio Integral Resource Center, "methoprene (Precor) ... arrests the growth of the flea at the pupal stage ... [and] will prevent further development of flea larvae for months after one application, but will not kill adults." One study found that the liquid Precor solution lasted 90 days, 15 days longer than the fogger version. Use insect growth regulators with restraint, because some pests have already shown resistance to them. You will still have to use any number of strategies to kill the adults of the original infestation.
- A combination of diatomaceous earth and silica gel in powder form, sprinkled around the floors and under furniture, is a relatively safe way to control fleas. Be sure to avoid breathing this stuff, though, as it can irritate your lungs.
- The Bio Integral Resource Center recommends pyrethrum, a botanical insecticide containing pyrethrins (LD_{50}: 1500-1800 mg/kg), as the safest effective material for treating animals directly. Avoid getting the powder or solution in the animal's eyes, nostrils, or mouth. Use a mask and goggles while you're dusting a pet with pyrethrum. One brand name is Zap. You can use it on both pets and their bedding.
- Several new products utilize citrus-oil extracts to kill fleas in all their developmental stages. The citrus-oil solutions are sprayed on carpeting, upholstery, and outdoor areas. (Many other products claim to repel fleas with various concoctions of herbal oils — eucalyptus, cedarwood, pennyroyal, mint oils, and the like. While they smell nice, there isn't much scientific evidence that suggests they're effective.)
- Pyrethrins combined with silica gel, such as the aerosol product Revenge, are available for use against fleas as well as ants and roaches.
- If you need to escalate the war, try Safer Flea and Tick Attack, which contains pyrethrins and piperonyl butoxide. The manufacturer claims it is safe enough to spray directly onto pets. But don't spray until combing indicates that the flea population is increasing. Unrestrained use of this spray may result in resistant flea species.
- Some flea collars contain DDVP (dichlorvos), an extremely toxic organophosphate nerve poison with an oral LD_{50} of 50 mg/kg. These collars emit a poisonous vapor which can effect both you and your pet. Leave flea collars on your pet no longer than six days and store them in a tightly sealed jar.
- Household fumigants are some of the most toxic pesticides. A thorough house cleaning will often avoid the need for them.

TERMITE W·A·R ALTERNATIVES

BY WILLIAM K. BURKE

When termites invade your home, you seem to face an awful choice: You can let the termites gnaw at your domestic and financial security. Or you can call an exterminator, a representative of a poorly regulated industry with a record of misusing toxic chemicals.

Rarely, houses have had to be torn down after contamination with the now-banned termiticides chlordane, heptachlor, and aldrin. Chlorpyrifos, currently the most popular termiticide, is a potent neurotoxin that can linger in your home's air for 16 years. Yet on a day-to-day basis, the pest-control industry receives very little attention from hard-pressed state regulatory agencies. "Even now there is no one who checks to see whether my men are applying chemicals safely," says Steve Tvedten, who owns a West Michigan pest-control company and has been a proponent of integrated pest management techniques (IPM) for termite control since he was poisoned by chlordane. Mr. Tvedten is part of a widely scattered but growing group of pest-control operators emphasizing non-toxic techniques for termite control.

How can you protect your home from termite damage *and* pesticide contamination?

First, learn all you can about termites. Subterranean termites are the most common in the U.S., a potential problem everywhere except Alaska, North and South Dakota, Montana, northern Maine, and northernmost Michigan and Minnesota. A pale, translucent white, subterranean termites bustle along passages they line with their own saliva. They have an uncanny ability to find the weak points in your home's defenses.

Finding those weak points yourself is the next step in common-sense termite control. Most homeowners don't even think about termites until they see mature, winged insects swarming from a small hole in foundation or walls. However, it takes several years for a termite nest to produce a swarm — and by then your home will already have been damaged. It's best to inspect annually for signs of termite infestion.

You can inspect your home or hire a pest-control company to do it. Do-it-yourself inspections are most effective in homes with crawlspaces or unfinished basements. Slab-construction homes or homes with finished basements usually should be inspected by a professional. Be wary of free inspections; they're often followed by a high-pressure sales pitch for an expensive, risky pesticide treatment, even when no termites are found. Pesticides should never be used as a preventive measure.

You'll need old clothes, a flashlight, a screwdriver or ice pick, and a hammer to search for the insects. Subterranean termites must have a damp, enclosed environment. Look along the foundation for the insects' distinctive mud tubes leading from the ground up into the floor framing or wooden sills. Break any mud tubes you find to cut the termite nest off from your house and allow ants, termites' deadly enemies, access to the nest. Look especially closely around your front and back porches. Builders often sweep sawdust and wood scraps out the doors, then build a porch over them, providing ideal conditions for termites.

Probe wooden beams and sills with your screwdriver or icepick. Termites carefully hollow out wood without breaking the surface in order to retain moisture and protect themselves from predators. If your blade breaks through the surface to reveal channels hollowed along the grain of the wood, you've got a problem. Use the hammer to tap on wood surfaces that you don't want to mar. Gently probe any areas that sound hollow.

Scrap lumber or logs around the foundation or in a crawlspace can become infested with termites and create a bridge for the insects into the house. Store them away from the house. If the wood is infested, haul it to a dump or other location far from your home, where the termites can perform their natural, beneficial function of digesting dead wood.

Nematodes, tiny parasitic worms, are currently the best non-toxic method for eliminating subterranean termites, which almost always nest in the soil, not inside your house. Nematodes work best in sandy soil and are effective for up to two years. However, the predatory worms may never reach the nest because termites seal it off to protect the egg-laying queen. So, in order to prevent reinfestation, plug up all openings the termites used to gain access into your house originally. Steven Schwimmer of Fumex pest control on Long Island, who's used nematodes to treat termite infestations since 1983, says they're just as effective as chemical pesticides for controlling subterranean termites *in the soil,* but his applicators must spot-treat with chemicals to eliminate termites in the wood in homes. Still, spot-treatment with chemicals is a less toxic alternative to wholesale soaking with pesticides indoors and out. For the very reason that they *aren't* as deadly or as long-lasting as chemical pesticides, nematodes are still controversial within the pest-control industry. If you can't find a firm that uses them, contact one of the distributors listed on pages 26 and 27. Nematodes must be introduced with professional equipment, but the distributors can provide nematodes and instructions to a pest-control company near you.

Once the termites are eliminated, replace damaged wood with the greenish, pressure-treated wood available at lumberyards. If the termites have burrowed beneath your porch to gain entry to your home, you may need to replace the porch. Wolmanized™ and other pressure-treated wood has been treated with toxic preservatives to repel termites, so wear a face mask and gloves when cutting it. Any cut ends will have to be retreated by soaking. With the possible exception of basements and crawlspaces, do not use pressure-treated wood inside your house, as your family or pets may come in contact with the chemical preservatives. If you can afford it, use more expensive but naturally termite-resistant redwood or cedar heartwoods.

If you live in an area heavily infested with termites, consider building a termite barrier of sand at the base of your foundation; the termites can't tunnel through sand to reach your home. A relatively new technique, sand barriers so far have proven as effective at preventing termite infestations as soaking the soil with pesticides.

The most important thing to remember when you do find termites is to take a month or two, study the problem, and get several opinions. Termites do their damage over a period of years, but a misapplication of termiticide can make your home uninhabitable in just a few hours.

OTHER TERMITES

Subterranean termites may be the most common, but two other termite species cause significant damage to American homes. Drywood termites infest California and Florida, Texas, and other Gulf Coast states. Dampwood termites wreak havoc along the West Coast.

Drywood termites usually settle first in attics. Look for small holes in walls, ceilings, or wood furniture and for their oval "droppings" (which resemble sawdust) below or around the holes. Severe infestations must be treated by fumigation: Giant "termite tents" are spread over a house, then pumped full of pesticides. But entomologist Walter Ebeling and his partner, geologist/civil engineer Charles Forbes, have developed a non-toxic fumigation technique using only hot air. This "baking" technique is becoming popular in California. Liquid nitrogen can be used to spot-treat for drywood termites, and a device called an electrogun is also proving effective. The Bio Integral Resource Center has published information on dessicating dusts that can prevent reinfestation by drywood termites (see page 26 for an address).

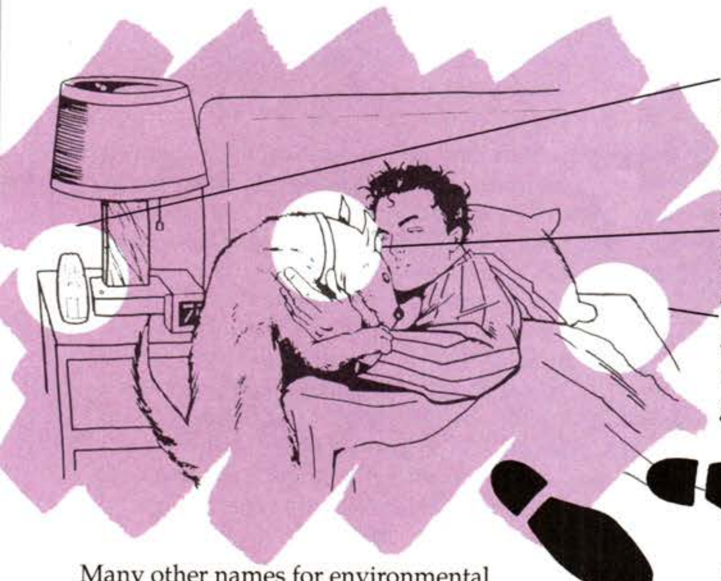
Dampwood termites are attracted to damp, decaying wood. If they're nesting inside the house, spot-treat as above for drywood termites. If they've penetrated the house from a below-ground nest, spot-treat, then build a termite barrier at the base of your foundation. (For more on termite barriers, contact the Bio Integral Resource Center.) In both instances, you'll need to remove the moist, decaying wood and repair the leaking pipes or other problems that attracted the dampwood termites in the first place. — *William K. Burke*

CLINICAL ECOLOGY:

Medicine For The Chemical-Sensitive?

By
Patricia
Poore

Clinical ecologists acknowledge and treat a disease that's most often known as "environmental illness." Pioneered in the 1950s, the specialty has recently come to be known as "environmental medicine." The diagnostic and therapeutic treatment methods of these physicians are not considered scientific by the medical establishment, and are often discounted by insurance companies.



Air freshener: *Paradichlorobenzene, naphthalene, phenol, cresol, ethanol, xylene, formaldehyde*

Flea collar: *Carbamates, organophosphates*

Polyurethane foam mattress: *Toluene diisocyanate gas*

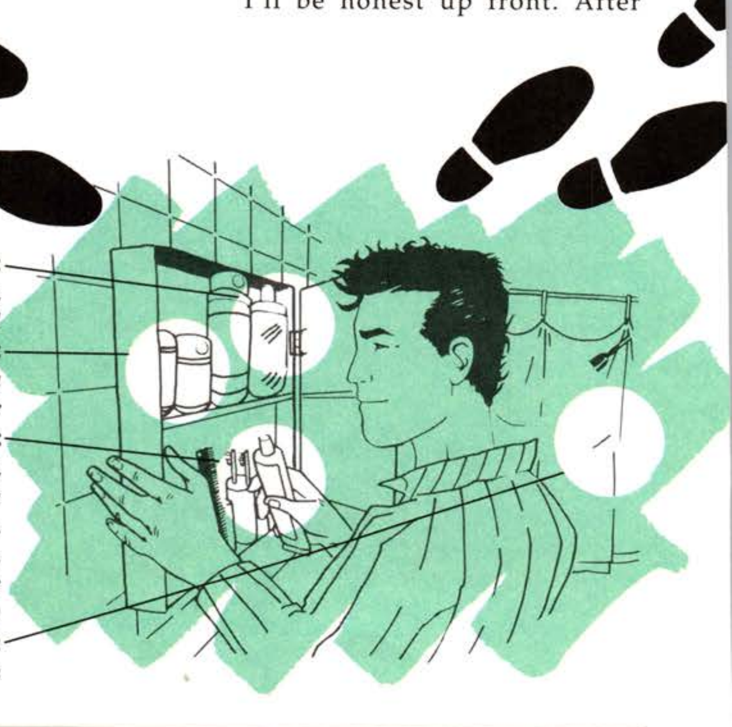
Many other names for environmental illness (EI) have come in and out of favor, some of them contributing to the dismissal of clinical ecology by mainstream physicians. *Cerebral allergy, total allergy syndrome*, and *allergic toxemia* apparently relate the disease to allergy; *chemical hypersensitivity syndrome* assumes that chemical exposure is the cause; *chemically-induced immune dysregulation* implicates immune dysfunction (despite medical controversy); and both *ecologic illness* and *twentieth-century disease* suggest a pandemic disease.

Although most medical researchers and practitioners do not even accept the existence of EI as such, there is virtually no disagreement about the existence of patients with MCS, or multiple chemical sensitivities. MCS is at the center of the argument led by clinical ecologists and some environmentalists. Their argument is that people with MCS are, like the canaries in coal mines, merely the first to be affected by environmental chemicals.

According to clinical ecologists, MCS patients' vulnerability may be caused by initial overdose or acute exposure to chemicals, by biochemical differences in the individual, by overall stress load, by viral or bacteriologic accompaniment, or by complex biological processes in the body which we don't yet fully understand.

Is this chemical sensitivity a warning to be heeded by all? That is, since MCS sufferers are hypersensitive to compounds that are admittedly toxic in higher doses, can we assume that the rest of us will eventually suffer, too — either when we experience similar concurrent stresses, or as the concentration of these compounds continues to grow?

I'll be honest up front. After



Dandruff shampoo: *Selenium sulfide, recorcinol*

Anti-perspirant spray: *Aluminum chlorohydrate*

Toothpaste: *Saccharine, ammonia, benzyl alcohol, sodium benzoate, fluoride, formaldehyde, polyvinylpyrrolidone (PVP plastic)*

Plastic shower curtain: *Polyvinyl chloride gas* slogging through countless papers pro and con, after searching for studies that don't exist, I've found that nobody has answered that question definitively. But I am convinced that there is a fast-growing number of people who are irritated by exposure to "safe" levels of environmental chemicals.

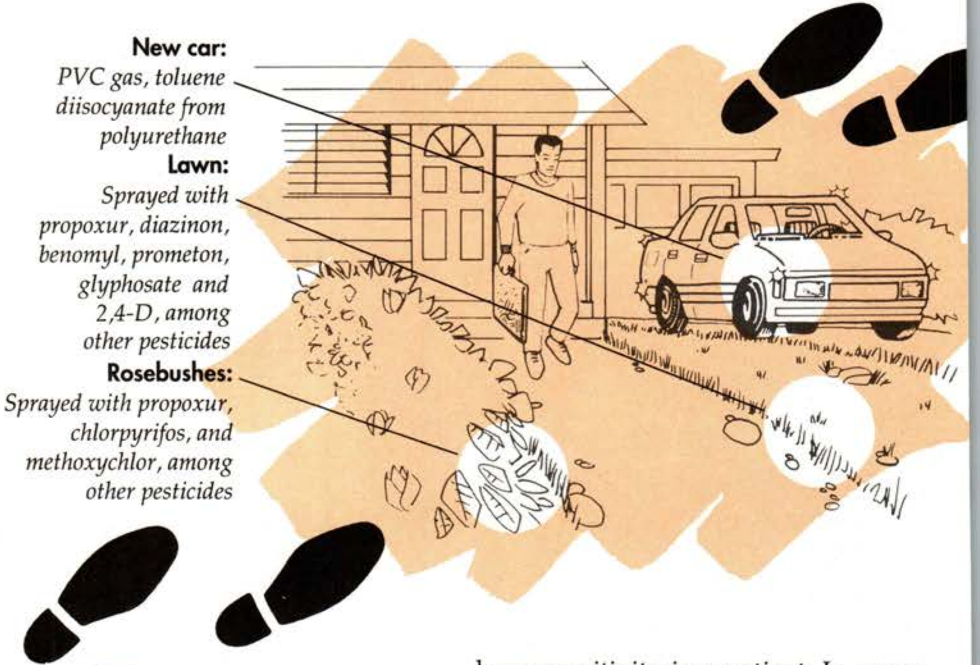
• WHAT IS EI?

The short definition given in each issue of the journal *Clinical Ecology* describes a "usually ... polysymptomatic, multi-system chronic disorder manifested by adverse relations to environmental excitants, as they are modified by individual susceptibility..." Environmental excitants apparently include industrial and domestic chemicals, cigarette smoke, diesel fumes, and alchoholic beverages.

More pertinent to my narrowed focus on MCS, a definition of multiple chemical sensitivities has been given as "an acquired disorder characterized by recurrent symptoms, referable to multiple organ systems, occurring in response to demonstrable exposure to many chemically unrelated compounds at doses far below those established in the general population to cause harmful effect."

Much documentation already exists describing symptoms in individuals who have been subjected to known acute or chronic exposure to chemicals. But what's novel about EI is that similar symptom complexes are seen in individuals without known "massive" exposure.

The medical literature on MCS is full of references to the "chemical event" or "acute exposure" that initiated hypersensitivity in a patient. In many cases referred to occupational health clinics, such an exposure did exist. Yet a study of patients at the largest EI clinic in the U.S. (Carleton, Texas) showed that 58% of them were unable to identify a triggering set of circumstances for their chemical intolerance.



New car:
PVC gas, toluene diisocyanate from polyurethane

Lawn:
Sprayed with propoxur, diazinon, benomyl, prometon, glyphosate and 2,4-D, among other pesticides

Rosebushes:
Sprayed with propoxur, chlorpyrifos, and methoxychlor, among other pesticides

Chlorinated scouring powder:
Chlorine fumes

Tap water:
Chlorine, heavy metals, plus hundreds of other chemicals including volatile organics

Bacon:
Nitrates

Strawberries:
Pesticide residues, including captan and methyl parathion

Many patients describe gradual onset over a period of months or years. These patients are commonly found to have had long-term, low-dose exposure to toxic compounds, whether through profession, hobby, location, or even through drinking water. Compounds include pesticides, solvents, perfumes, dyes, synthetic fabrics, and natural gas; as well as inhaled chemicals, of which formaldehyde is the most recognized example. All symptoms can be complicated by infection or hormonal influences.

Patients often report chronic nausea, acquired food intolerance (skin rashes, diarrhea, bloating). Also reported are an increase of ordinary allergy and increasing sensitivity to body molds such as *candida albicans*. Patients often exhibit an inappropriate response to virus. These symptoms are thought to be evidence of chemically-induced immune dysregulation.

The patient profile is diverse and includes children. In general, however, there is a predominance of white female patients in their 30s or 40s. (Some research indicates sex differences in enzyme and immune functions, which may account for heightened allergic sensitivity.)

No studies have been done to separate environmental illness from generalized and psychosomatic disorders of the pre-chemical age. No graph of "reported incidences" can be drawn to suggest increase, decrease, or stabilization of a medical trend. Some clinicians at occupational health clinics claim that MCS significantly affects the lives of 2-

(continued on p. 34)

I am indebted to the work of Mark R. Cullen, MD, who brought together and edited a remarkable collection of research papers that illustrate the full range of current medical opinion. (Occupational Medicine: State of the Art Reviews. *Vol. II No. 4:* Workers with Multiple Chemical Sensitivities, *Oct.-Dec. 1987). Hanley & Belfus, Inc., publisher.*

Many of the direct quotes here are from that collection. Limited space precluded footnotes; please write directly to me for a bibliography. — *P. Poore*

Illustrations by George Visola

SODIUM BENZOATE *preserves foods;* PHOSPHATES *(mineral supplements) add desirable enrichment to bread.*

"Ladies, let the chemicals do your housework."

A record 50-million-dollar assortment of chemical housewares is providing a field day for America's "pitchwomen." Demonstrators like Hannah Witty (left), with an intuitive knowledge of feminine psychology to go by and these cleaners, gleamers, menders, polishers and shiners to shout about, can gather a covey of housewives around them almost as fast as they can say "fantastic."

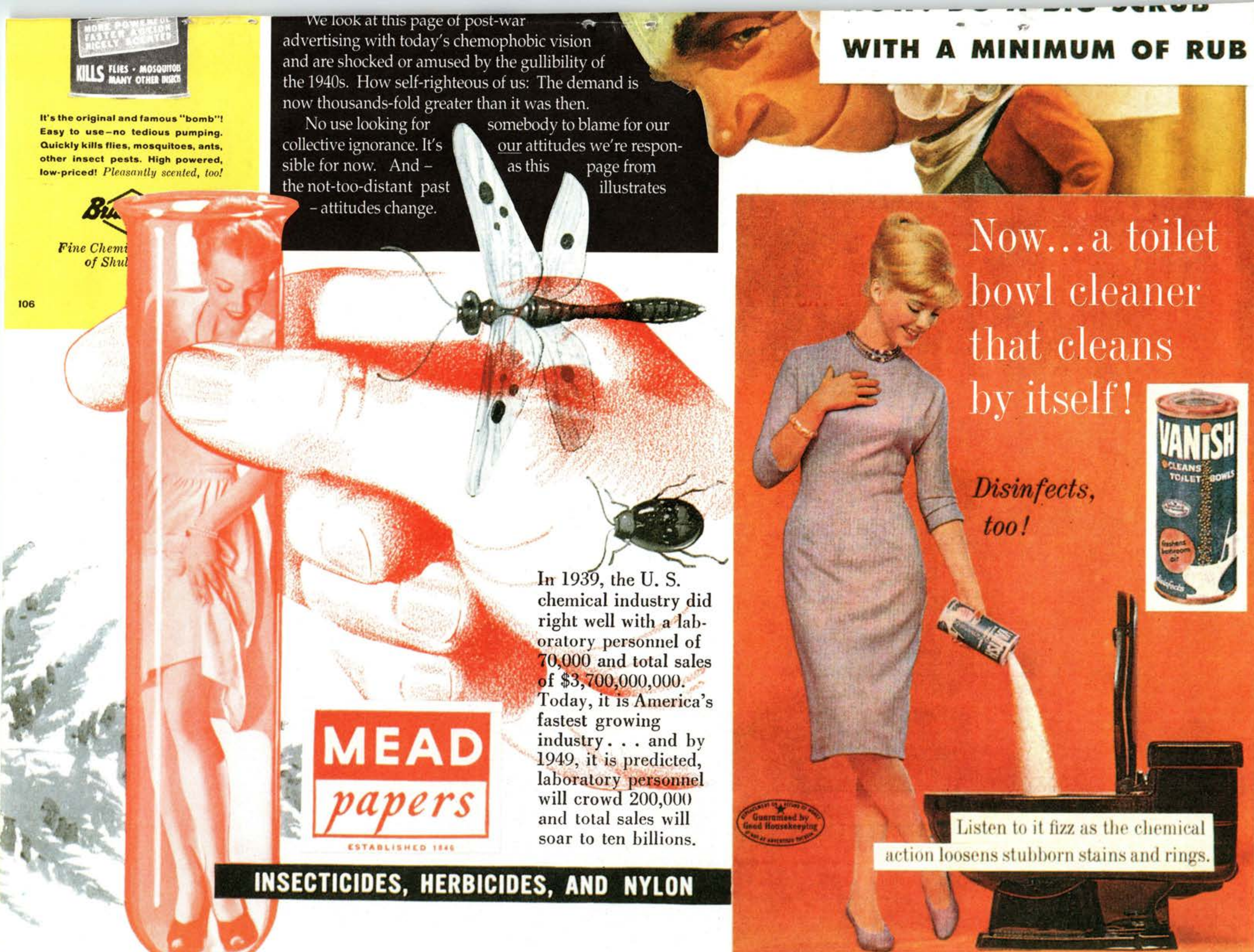
Disposable Decades

Du Pont's "Better Things for Better Living . . . Through Chemistry" is the best known of the chemophilic slogans we accepted so readily in a more naive time. To a great extent, life has been improved through modern chemistry. But the introduction of synthetic compounds had an environmental dark side.

ORONITE
CHEMICAL
COMPANY
The Name to Watch in Chemicals
NOW! DO A BIG SCRUB

We look at this page of post-war advertising with today's chemophobic vision and are shocked or amused by the gullibility of the 1940s. How self-righteous of us: The demand is now thousands-fold greater than it was then.

No use looking for somebody to blame for our collective ignorance. It's our attitudes we're responsible for now. And – as this page from the not-too-distant past illustrates – attitudes change.



It's the original and famous "bomb"! Easy to use—no tedious pumping. Quickly kills flies, mosquitoes, ants, other insect pests. High powered, low-priced! *Pleasantly scented, too!*

Fine Chemi
of Shul

106

WITH A MINIMUM OF RUB

In 1939, the U. S. chemical industry did right well with a laboratory personnel of 70,000 and total sales of $3,700,000,000. Today, it is America's fastest growing industry . . . and by 1949, it is predicted, laboratory personnel will crowd 200,000 and total sales will soar to ten billions.

INSECTICIDES, HERBICIDES, AND NYLON

Now... a toilet bowl cleaner that cleans by itself!

Disinfects, too!

Listen to it fizz as the chemical action loosens stubborn stains and rings.

10% of the general population. A comprehensive 1985 report by the Ontario Ministry of Health concluded: "While we believe that there is evidence to support the view that a significant number of persons show symptoms of environmental hypersensitivity, we are unable to make any definitive statement about the prevalence..."

Treatment involves avoidance of environmental excitants and allergens, nutritional supplementation, and steps to strengthen the theoretically damaged immune system (i.e., control of yeast infections, antigen immunotherapy, stress reduction).Improved ventilation is called for, as well as removal of suspected materials (new carpet, fiberboard furniture, cigarette smoke, etc.).

• THEORIES

The first thing distinguishing clinical ecologists in practice is their belief that the onset of MCS depends on total stress load, including psychosocial, physical, chemical, antigenic, and infective stressors. This may not sound revolutionary to a public convinced that "stress" plays a part in sickness. But it remains a scientifically unproven theory in the medical establishment's understanding of disease.

Permanent markers:
Benzene
Rubber cement:
Petroleum distillates
Correction fluid:
Trichloroethylene, cresol, ethanol, naphthalene
Wet paint:
Aliphatic hydrocarbons, ethylene, mineral spirits, and other solvents
Plastic and pressed-wood furniture:
Formaldehyde, PVC and toluene diisocyanate gases

Their theory of *total environmental load* or TEL presumes that the sum of all toxic exposures predicts health effects. So avoidance of a variety of potential environmental stressors may decrease a person's symptoms upon exposure to any given chemical. Clinical ecologists also theorize that foods, chemicals, and common inhalant allergens can cross-react immunologically.

An adjunct to the cross-reactivity theory is that *chronic low-level* exposure is responsible for immunologic damage. The vast majority of chemicals to which MCS patients are most severely affected are compounds that did not exist 50 years ago. According to clinical ecologists, we're now exposed to much higher concentrations of natural chemicals, such as ammonia and formaldehyde, as well as massive amounts of synthetic chemicals to which our ancestors were never exposed. Also, the effects of complex mixing of traces of substances have not been studied at all.

Clinical ecologists also point out the *cumulative* nature of chemical exposure. Many toxic chemicals are lipophyllic (stored in body fat) and remain in the body for decades; they can theoretically affect the health of an individual for long periods. Virtually every American has detectable levels of synthetic chemicals (e.g., halogenated hydrocarbons) in his body.

The medical establishment does not accept the theories of clinical ecology. In fact, to read much of the establishment criticism, patients exhibiting symptoms to low-level chemical exposure are maladapted individuals who need understanding, psychotherapy, and stress management techniques. As with victims of any disease, that is probably true. But the medical establishment rejects the concept that EI is a true disease. Although MCS is a recognized syndrome, much of the establishment takes the position that it is largely somatoform — meaning that psychological factors are known or presumed to be of etiologic (causal) importance.

Establishment doctors point to several reasons for their skepticism, including the broad range and vagueness of symptoms, and the inability of current laboratory testing to show consistent differences in EI patients or to show immune dysfunction.

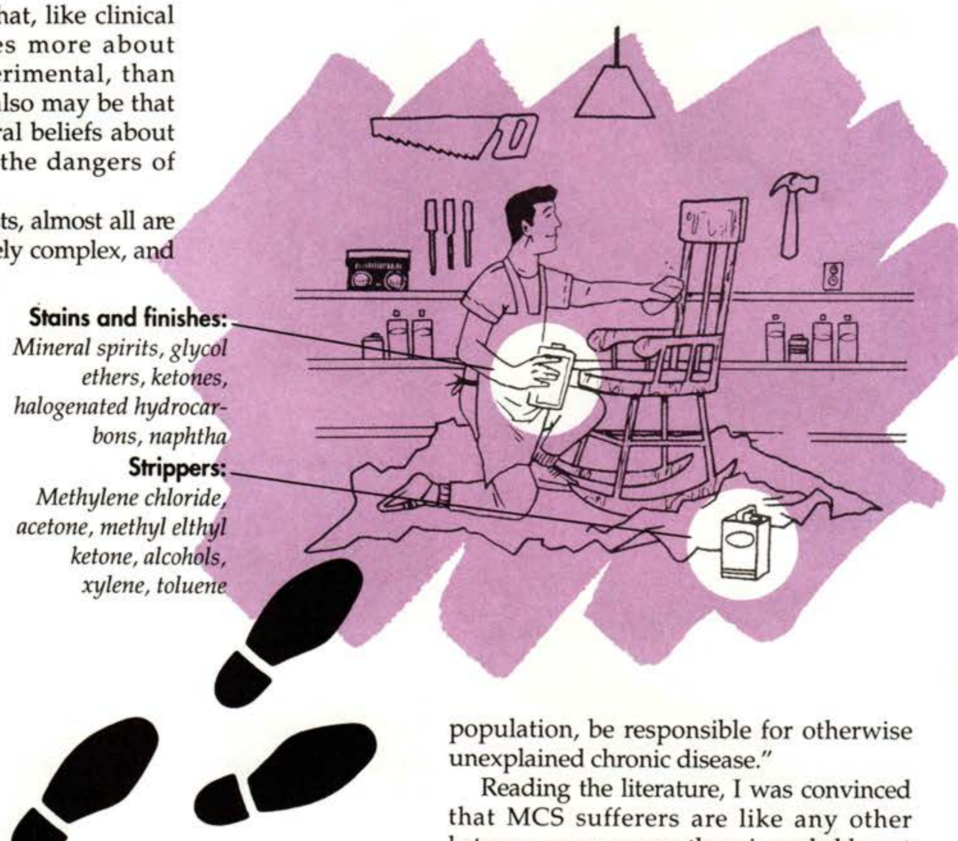
One medical anthropologist describes a social reason for the establishment's strongly worded dismissals. He points out that clinical ecologists, unlike herbalists and acupuncturists who clearly come from a different cultural, historical, and philosophical stance, are degreed physicians who went to the same medical schools and received the same training as the majority of doctors. For the medical establishment to not challenge these doctors, their theories and methods, would be to condone their views — and this would be tantamount to an admission that environmental medicine can treat patients for whom established medicine has no explanations or cure.

While the medical establishment has remained skeptical, the public has

Swimming pool:
Chlorine, muriatic acid
Disinfectants:
Diethylene or methylene glycol, sodium hypochlorite, phenols
Dry-cleaned clothes:
Perchloroethylene

embraced it much more easily. It may be that, like clinical ecologists themselves, the public cares more about symptoms and treatment, however experimental, than about laboratory proof of EI's existence. It also may be that clinical ecology taps into our current cultural beliefs about the degradation of the environmentand the dangers of ubiquitous toxic compounds.

As far as the tests used by clinical ecologists, almost all are controversial. The immune system is extremely complex, and multiple tests must be used to point to anything. This is usually indefensibly expensive for the patient, and clinical ecologists are more interested in treating symptoms than relying on tests, especially given the possibility that the right tests don't exist yet. Only a few compounds have been well studied (in animal testing) as immunotoxics (halogenated aromatics, heavy metals, and organochlorine pesticides).



Stains and finishes:
Mineral spirits, glycol ethers, ketones, halogenated hydrocarbons, naphtha
Strippers:
Methylene chloride, acetone, methyl elthyl ketone, alcohols, xylene, toluene

Theron Randolph, M.D., the father of modern environmental medicine, feels that the medical field of allergy has taken two polarized courses: *endogeny*, or traditional allergy with anthropocentric emphasis, and *exogeny*, which is environment-focussed. The upshot has been the "increasing tendency to treat both infections and allergic processes by means of drugs aimed to alleviate symptoms or to alter the body mechanisms involved (endogeny), rather than to identify, minimize, or neutralize the impingement of specific environmental experiences (exogeny)."

Heavy smog:
Chlorinated compounds, benzene, ozone
Companion's cigarette smoke:
Benzene, carbon monoxide, carbonyl sulfide, formaldehyde, hydrogen cyanide, plus a host of others

Simplistically, what he's saying is that clinical ecology considers the environment to be sick, not the individual. This is a brand new way of thinking in medicine.

• A CONCLUSION (FOR NOW...)

I would agree with one doctor's assessment: Patients with MCS "are genuinely made ill by noxious agents from the environment. It is unclear whether ... they are more vulnerable," or whether "they may be reacting in a more acute fashion to agents that also may, in the majority of the population, be responsible for otherwise unexplained chronic disease."

Reading the literature, I was convinced that MCS sufferers are like any other heterogeneous group; there is probably not just one syndrome operating here, and each patient has individual physical, psychological, and social factors that contribute to disease onset, symptoms, degree of disability, coping mechanisms, accompanying depression or anxiety, and duration. (Not one paper pointed out that such factors could result in the patient's *downplay* or denial of symptoms, not only amplification, an oversight I found inexcusable.) Some individuals are undoubtedly bona-fide nut cases. But apparently that is true with any disease.

I am unconvinced that the lack of reliable tests to "prove" disease means that disease is not present. There are too many historical cases of diseases that could not initially be predicted or explained, including AIDS. In fact, AIDS is particularly pertinent. Until its recognition, the potential for such devastating immunological impact by a viral agent wasn't appreciated. And the reported symptoms of early AIDS patients were not always deemed to be physiological.

Many outspoken critics of environmental medicine are medical researchers. Clinical ecologists, by definition, are clinicians, dealing more with patients than with immunologic research and testing. There is a marked lack of interest and money going into research. This is not the fault of the practitioner.

Food for thought: Over 70,000 new chemical compounds have been introduced into the environment since the second world war. There has been virtually no time to assess their long-term risks to health or ecological systems. At the very least, environmental illness should not be dismissed until much more study, both in the clinic and in the research labs, is undertaken.

PLANTS FOR HEALTHIER

by Janet Marinelli

In the 1970s, like everyone else I know, I went nuts over houseplants. Begonias and bromeliads crowded my windowsills, and feathery asparagus ferns cascaded from the rafters. I grew *anything* — even sweet potato plants from tubers poked with toothpicks and half-submerged in water. All this greenery was a great way to bring a bit of nature indoors. Alas, like almost everyone else I know, I gave away my houseplants in the '80s, and moved on to cultivate my Great Outdoors.

Now the National Aeronautics and Space Administration tells me it just may be time to dust off those terra-cotta pots and miniature gardening tools. According to the agency, there's a new, improved reason to grow houseplants — they can remove formaldehyde and other health-threatening pollutants from indoor air.

• SICK-BUILDING SYNDROME

More on NASA's findings in a minute, but first a bit of background. In the

HOMES

1970s and '80s, most environmental legislation focused on improving the quality of air *outdoors*. However, studies conducted in the U.S. and Europe reveal that we spend more than 90 percent of our time *indoors*. And according to U.S. Environmental Protection Agency (EPA) studies, air inside energy-efficient houses is often *two to five times more polluted* than the air outside, depending on where you live.

In a four-volume report on indoor air quality submitted to Congress last

Photos by Elvin McDonald

LIVING FILTERS

In NASA studies on using houseplants to reduce indoor air pollution, the following species dramatically reduced the levels of three common household pollutants — formaldehyde, benzene, and trichloroethylene:

Aloe barbadensis

Common names: Aloe plant, Aloe vera

Description: The resinous juice in the fleshy leaves of this popular plant is often used as a home remedy for minor burns, and in soaps, lotions, and other cosmetics that abound in health-food stores. The plant's pointy, pale green leaves are armed with hard, whitish-to-reddish spines on the margins, and they grow in compact rosettes that get about 12 inches tall. New rosettes sent up from the base of the plant soon fill a pot with foliage.

How to grow: These plump plants are easy to grow. Just remember not to overwater. Soak them thoroughly, but let the soil dry out before you water again — well-drained soil will help. Aloes love sunny windows but will tolerate less light.

Chamaedorea seifrizii

Common names: bamboo palm, reed palm

Description: Chamaedoreas are popular small palms with neat, green, bamboolike stems. This particular variety, native to Mexico, has clusters of small, slender canes and a lacy appearance.

How to grow: Chamaedoreas are among the most popular palms for houseplants because they thrive in poor light. Try a north window, or a spot where direct sun is filtered by blinds, sheer curtains, or the leaves of other plants. These most accommodating palms also tolerate standard potting soil, and average house temperatures and humidity. Keep them evenly moist.

Chlorophytum elatum vittatum

Common names: spider plant, airplane plant

Description: I'll bet you can't find one person who hasn't grown a spider plant at one time or another. *C. elatum vittatum* is the type with white-striped leaves. Like all spider plants, its long, curved leaves resembling large blades of grass grow in clumps. The plants frequently send up tall, spiky stems with small white flowers that are followed by miniature duplicates of the mother plant. When the new plants are heavy enough, the stems bend over, making spider plants perfect for hanging pots.

How to grow: This undemanding houseplant is great for black thumbs. Give it bright light (not direct midday sun), standard potting soil, and average house temperatures and humidity. Water when the soil begins to dry out.

Chrysanthemum x *morifolium*

Common names: pot mum, florist's mum

Description: These are the same plants that produce spectacular flowers in blazing colors outdoors every autumn, only they're grown in pots to be brought inside. Commercial growers force bloom so they can be sold at florists and nurseries year round.

How to grow: You can grow pot mums yourself by taking cuttings from outdoor plants in spring, planting about five to an eight-inch pot, and leaving them in containers outdoors until they bloom in the fall. Once the blooms wither, cut back the stems to about an inch or two, place them in a cool but frost-free spot, and keep the soil barely moist till spring. Then plant

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year, the EPA concluded that "indoor air pollution represents a major portion of the public's exposure to air pollution and may pose serious acute and chronic health risks." The EPA study goes on to state that although risk estimates on the health effects of most pollutants have not yet been quantified, the estimates for radon, tobacco smoke, and formaldehyde and other volatile organic compounds (VOCs, or carbon-based chemicals that vaporize at room temperature) "demonstrate that indoor air pollution is among the nation's most important environmental health problems."

In the early 1950s, Dr. Theron G. Randolph linked indoor air pollution to allergies and other chronic illnesses, one of the first medical doctors to do so. Since then, indoor air problems have only gotten worse.

During the past 25 years, the materials used for building and home furnishings have changed dramatically. Pressed-wood products and fiberboard, which emit or "offgas" trace levels of organic chemicals, have replaced solid wood in most building construction. Many home furnishings are now made of pressed board, plastic, and artificial fibers, which offgas even more volatile organic compounds into indoor air. Everyday products like cleaners, insecticides, glues, air fresheners, hair sprays, shoe polish, and magic markers add to the pollutant load.

The energy crisis of the mid-1970s aggravated the problem. Many of us tightened up our houses to save energy and money. This did make our homes warmer and helped curb the nation's enormous appetite for energy, but it also decreased the rate at which fresh(er) outdoor air replaces stale, polluted indoor air. People in highly insulated homes and buildings began to complain of a multitude of health problems, including itchy eyes, rashes, drowsiness, headaches, and respiratory and sinus congestion. Researchers concluded that the airtight sealing of these buildings, which trapped the various organic chemicals offgassed by furnishings, cleaning products, and so on, was the culprit. This phenomenon was christened the "sick-building syndrome." One world health organization estimates that about 30 percent of all new or remodeled buildings have air-pollution problems.

In 1983, EPA studies identified more than 350 volatile organic compounds in one Washington, D.C., nursing home. Other agencies and researchers have confirmed the presence of large numbers of these substances inside modern buildings. According to EPA, the most worrisome indoor pollutants are radon, tobacco smoke, disease-causing microorganisms, volatile organic compounds, polycyclic aromatic hydrocarbons (which form in the air when coal, oil, or wood are burned), asbestos, combustion gases such as carbon monoxide and nitrogen dioxide, and particles.

The health effects of these pollutants, according to the agency, range from irritation of the eyes, nose, throat, and respiratory system to damage to the nervous system, kidneys, liver, and heart to impaired development in

children to cancer.

What can you do to improve the air quality in your home? The most important thing, says EPA, is to get rid of potential sources of pollution: Simple tests can tell you whether radon is a problem, for example, and if it is, many publications can tell you what measures will drastically reduce radon levels in your home. Air exchangers can improve ventilation in your house without sacrificing energy efficiency. You can avoid toxic cleaners and other products. You can make sure that gas stoves and other appliances are working efficiently to minimize your exposure to combustion byproducts. Some of the many available air cleaners can remove smoke and other airborne particulates from your indoor air (see "Keepers," page 52). However, air cleaners *don't* effectively remove formaldehyde and other gaseous pollutants — which makes NASA's research on plants as air filters so intriguing.

• NATURAL SOLUTION

"Bioregenerative" isn't in my *Webster's*, but it's a word Dr. Bill Wolverton is very fond of. An environmental engineer with advanced training in chemistry and micro-biology, Dr. Wolverton signed on with NASA in 1971 (one of the first non-rocket engineers hired) to develop bioregenerative life-support systems for future space stations. Waste treatment, water supply, and air-pollution control in these self-enclosed vehicles were at the top of his agenda. Prompted by a NASA study that identified 107 volatile organics in the air inside the Skylab spacecraft, Dr. Wolverton began to experiment with ways to use plants to purify indoor air.

Dr. Wolverton and colleagues focused on three pollutants — formaldehyde, benzene, and trichloroethylene (TCE) — because they're the three most common volatile organic compounds found indoors and have been implicated in many cases of sick-building syndrome:

- Formaldehyde comes mostly from urea-formaldehyde (UF) foam insulation (a problem highly publicized in the early 1980s) and particleboard or pressed-wood products, particularly sub-flooring. It's used in many paper products treated with UF resins, including grocery bags, waxed papers, facial tissues, and paper

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them in the garden, take cuttings when the new growth is about four inches high, and start the cycle all over again.

If you want to impress your friends, grow pot mums in tree form: In early spring, start with a young plant with a strong, healthy main growing tip. Remove all side shoots as soon as they form. Your goal is a finished shape consisting of a bare trunk topped by a ball of leaves and, in about 10 months, flowers. When the flowers fade, follow the same instructions above.

To prolong the blooms, give pot mums bright light (early morning or late afternoon sun) and lots of water, and keep them cool (60 to 70 degrees F).

Dracaena deremensis 'Janet Craig'

Common name: Janet Craig dracaena

Description: Dracaenas are palmlike plants with sword-shaped leaves often clustered at the top of canelike stems. Several plants of varying heights are usually grown in the same pot for added impact. 'Janet Craig' has shiny, dark-green leaves and will grow to 5 or 6 feet tall if the light is right.

How to grow: This dracaena likes moderate or bright light, but no direct sun. Don't water until the soil begins to dry out. Like most dracaenas, this one isn't fussy about temperature or humidity. And standard potting soil will do.

Dracaena deremensis 'Warneckeii'

Common name: Warneckeii dracaena

Description: This dracaena is usually smaller than 'Janet Craig' and has narrower leaves with white pin stripes along the leaf edges.

How to grow: This plant will take plenty of abuse, but never put it in the sun. It'll survive in low light (like the kind that you read by), but don't expect it to grow much. If you are giving it the minumum of light, don't overwater or overfertilize the plant. Leaves will drop off if the soil is too wet or too dry. If the leaf tips are turning brown, you're probably not watering enough.

Dracaena marginata

Common name: dragon tree

Description: This variety has the narrowest leaves of any commonly cultivated dracaena. The leaves have red stripes on the edges.

How to grow: This plant likes bright light, but no direct sun. Keep it moist, but not soggy. It's most accommodating about average indoor temperatures and humidity. Don't panic if the leaves yellow and die back a bit; the plant has a habit of doing this from time to time.

Epipremnum aureum

Common name: golden pothos, Devil's ivy (also goes by the botanical name *Scindapsus aureus*)

Description: You see this plant either cascading over a hanging basket or climbing up a trellis or a piece of bark. Its waxy, heart-shaped leaves look a lot like those of the heart-leafed philodendron (see below). The leaves are variegated, or covered with pale white or yellow splotches; the brighter the light, the more splotches.

How to grow: This plant prefers bright indirect light and regular watering, but it'll tolerate neglect. It may not die, but it will get spindly and anemic-looking if the light is too low.

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towels, and in many common household cleaners. UF resins are also used as stiffeners, wrinkle resisters, water repellents, fire retardants, and adhesives in floor coverings, carpet backings, and permanent-press clothes. What's more, tobacco smoke is a source of formaldehyde, as are stoves, heaters, and other gas appliances.

Exposure to formaldehyde can cause eye, nose, and throat irritation, coughing, asthma, rashes, headaches, dizziness, nausea, vomiting, and nose bleeds. Some studies indicate that formaldehyde depresses the central nervous system. And since formaldehyde has been shown to cause cancer in laboratory animals, it's a suspected human carcinogen.

- Benzene is a common solvent used in gasoline, inks, oils, paints, plastics, and rubber. It's also used in the manufacture of detergents, dyes, and pharmaceuticals.

It's been known for a long time that benzene irritates the skin and eyes. Breathing high levels of benzene causes dizziness, weakness, headaches, nausea, blurred vision, respiratory problems, tremors, irregular heartbeat, liver and kidney damage, and paralysis. Chronic exposure to even relatively low levels causes headaches, loss of appetite, drowsiness, nervousness, psychological disturbances, and diseases of the blood system, including anemia and bone-marrow disease. In bacterial studies, benzene has been shown to be mutagenic and embryotoxic, and it's been linked to leukemia in humans.

- Trichloroethylene is used in dry cleaning. It's also used in printing inks, paints, lacquers, varnishes, and adhesives.

In 1975, the National Cancer Institute first reported that an unusually high incidence of liver cancer was observed in mice exposed to TCE; the Institute now considers the chemical a powerful liver carcinogen.

One of the first reports to come out of the NASA studies was released in 1984. It described experiments on the ability of three common houseplants in pots with potting soil — golden pothos (*Scindapsus aureus*), nephthytis (*Syngonium podophyllum*), and spider plant (*Chlorophytum elatum vittatum*) — to remove formaldehyde from contaminated air. The plants were placed in sealed, Plexiglass chambers in which temperature and humidity were controlled. The chambers were illuminated externally with grow lights. The air inside the chambers was contaminated with formaldehyde at concentrations of 15 to 37 parts per million (ppm). Changes in the level of formaldehyde were monitored over a period of 24 hours.

The result? All three plants removed substantial amounts of formaldehyde from the air inside the Plexiglass chambers. Golden pothos and nephthytis removed approximately 67 percent of the formaldehyde in 24 hours. The spider plant rapidly decreased the formaldehyde level from 14 to 2 ppm in six hours and below the detection limit of 2 ppm before the 24 hours were up. These surprising results led to a second set of experiments with the spider plant, this time using 37 ppm of formaldehyde. Within 24 hours, the plant removed an astounding 95 percent of the toxic chemical!

Later research suggested that other plants, especially philodendrons, were even more effective than spider plants at removing formaldehyde. And in 1985, in the *Journal of the Mississippi Academy of Sciences*, Dr. Wolverton reported that some plants also got rid of combustion pollutants such as nitrogen dioxide in air.

These early studies generated such interest (and, not surprisingly, so whetted the appetite of the commercial houseplant industry) that in February 1988 the Associated Landscape Contractors of America (ACLA), a trade group, joined NASA in a two-year study of 16 common houseplants: Chinese evergreen (*Aglaonema* 'Silver Queen'), reed palm (*Chamaedorea seifrizii*), spider plant (*Chlorophytum elatum*), pot mum (*Chrysanthemum* x *morifolium*), Janet Craig dracaena (*Dracaena deremensis* 'Janet Craig') , striped dracaena (*Dracaena deremensis* 'Warneckii'), corn plant (*Dracaena fragrans* 'Massangeana'), red-edged dracaena (*Dracaena marginata*), golden pothos (*Epipremnum aureum*), African daisy (*Gerbera jamesonii*), banana (*Musa*), elephant's ear philodendron (*Philodendron domesticum*), heart-leaf philodendron (*Philodendron scandens oxycardium*), English ivy (*Hedera helix*), snake plant (*Sansevieria trifasciata* 'Laurentii'), and peace lily (*Spathiphyllum* 'Mauna Loa').

All the plants came from local nurseries. They were kept in their original pots and potting soil and left in NASA greenhouses between tests. Like the earlier experiments, these were done in Plexiglass chambers for a period of 24 hours. This time, formaldehyde, benzene, and trichloroethylene were introduced.

This round of experiments confirmed earlier findings: Although all the plants tested removed the three toxic pollutants to one degree or another, some plants were much better at removing them. For example, the snake plant was among the best at removing formaldehyde, and the Gerbera daisy, pot mum, and English ivy were great against benzene. (See "Living Filters" starting on page 37 for a list of some of the most effective plants and how to grow them). However, all the plants have not yet been tested for all the chemicals (and hundreds of houseplants still haven't been tested at all), so it's impossible to point to this or that plant as *the* botanic champ at combatting indoor pollution.

How do the plants remove the pollutants? According to Anne Johnson, who's been heading up the NASA research since Bill Wolverton retired last year, scientists don't know for sure. It's common knowledge that plants absorb carbon dioxide and release oxygen through their stomata, or leaf pores, so it's only logical that some of the gaseous pollutants are absorbed the same way. However, when NASA removed the foliage and tested the denuded plants, removal rates didn't change all that much. Researchers got the best results when the leaves were left on, but any foliage covering the potting soil was removed to increase contact between the soil and the air inside the chamber. This, in addition to earlier studies elsewhere indicating that soil acts as a "sink" or sponge for certain pollutants, leads NASA to suspect that most of the dirty work is being done by microbes living on the plant roots. The research continues.

• BONES OF CONTENTION

Last year, the Associated Landscape Contractors of America established a "Foliage for Clean Air Council" to help publicize the results of NASA's latest study. And commercial growers aren't wasting any time taking advantage of the too-good-to-be-true marketing possibilities implicit in it. For example, Yoder Brothers, Inc., an Ohio-based houseplant wholesaler, recently unveiled a promotional campaign (slogan: "Yoder can help you breathe easier") featuring NASA's "Pollution Fighters" — a trademark already registered by the company.

All this has some horticulturists hot under the collar. One of the most outspoken critics has been Dr. Joseph E. Howland, a professor of advertising and marketing and a retired professor of horticulture at the University of Nevada in Reno. In a recent issue of the trade journal *Nursery Manager*, he pointed out that NASA's studies have yet to be published in research journals and that press releases are not enough to establish the legitimacy of scientific claims. He advised commercial growers not to jump on the bandwagon quite yet.

Others have noted that NASA studied only three of the scores of volatile organic pollutants that have been detected in indoor air. They also point out that most people don't live in hermetically sealed Plexiglass chambers with only artificial light and that plant metabolism might be dramatically different in houses. Not to mention the fact that NASA was exposing the plants it studied to massive amounts of the pollutants — 20 or more times the levels normally found indoors. During the final year of its joint ALCA study, NASA exposed a handful of plants to low levels of benzene and TCE. These experiments suggest that some plants (most notably the Aloe plant) may excel at removing small amounts of pollutants, while others remove large doses most effectively.

But the biggest bone of contention has been *how many* plants are needed to help purify the air of the average home. Over the years, NASA has revised its estimates radically downward. According to the 1984 study, as many as *70* spider plants might be needed to remove formaldehyde from the average house. Current estimates using National Research Council figures on levels of formaldehyde in the typical energy-efficient home and NASA's most recent plant data are that two snake plants could cleanse the air in an average room about 10 feet X 15 feet X 8 feet. One 'Janet Craig' dracaena or one reed palm would suffice. On the other hand,

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Gerbera jamesonii

Common names: African daisy, Gerbera daisy, Transvaal daisy

Description: This South African native has leaves resembling large, ruffled dandelions and spectacular daisy flowers in a variety of colors.

How to grow: Unless you've got a greenhouse, let the florist grow the gerbera for you and consider it a long-lived bouquet (on the plant, flowers will last four to six weeks and cost a lot less than cut flowers). Keep the store-bought plant moist, and in bright light (but not sun).

If you're really ambitious, you can grow these plants outdoors, then force them to bloom inside in winter: In fall, dig up a clump, cut it back, and pot it. Bring it indoors, put it in a bright spot, and water moderately, but never let the soil dry out. When the plant starts growing, you can try feeding it every couple of weeks or so. Start saying prayers, and the plant just may flower. In spring, replant the daisy outdoors.

Hedera helix

Common name: English ivy

Description: This trailing and climbing plant comes in countless shapes, sizes, and variations on green: with leaves rounded, curled, crinkled, or indented, in grey-green or yellow-gold or with white margins. The tiny-leaved ivies are most popular for indoors. You can use ivies as hanging plants, as "ground covers" in pots featuring taller plants, as a "living curtain" in a window. They're also fun to train into topiary.

How to grow: Many ivies tolerate low light but prefer bright, indirect light (especially the variegated varieties); sun will scorch the leaves. English ivy thrives in relatively cool temperatures — 60 to 66 degrees F during the day and 40 to 50 degrees at night.

Musa

Common name: banana tree

Description: Exotic and lush, bananas won't ever supplant the Caribbean vacation, but they make it easier to pretend that you're basking in the tropics. The banana "tree" is really just a giant herb; its "trunk," a conglomeration of leaf stalks that wrap tightly round one another. The leaves of the dwarf banana — about 1 to 1-1/2 feet wide and 3 to 4 feet long — aren't as big as those of the common banana, but unless you live in Buckingham Palace they're impressive enough. Be forewarned, however: Even these diminutives demand plenty of room, and plenty of light.

How to grow: Bananas need the brightest, warmest position possible; a greenhouse (sigh) would be great. Keep the soil moist. Ditto the air (fanatics use humidifiers). Bananas also love rich but well drained soil; for spectacular results, plant one in rich compost. Don't expect it to fruit or flower indoors unless you say the rosary regularly, spend 40 days and nights in a desert, or turn the garage into a greenhouse.

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FUTURE HOUSE

NASA's discovery that houseplants remove dangerous pollutants from indoor air is no great surprise to gardeners. We've always been convinced that plants, indoors or out, are good for the body as well as the soul. Now space science is making believers of engineers and architects, too.

Bill Wolverton

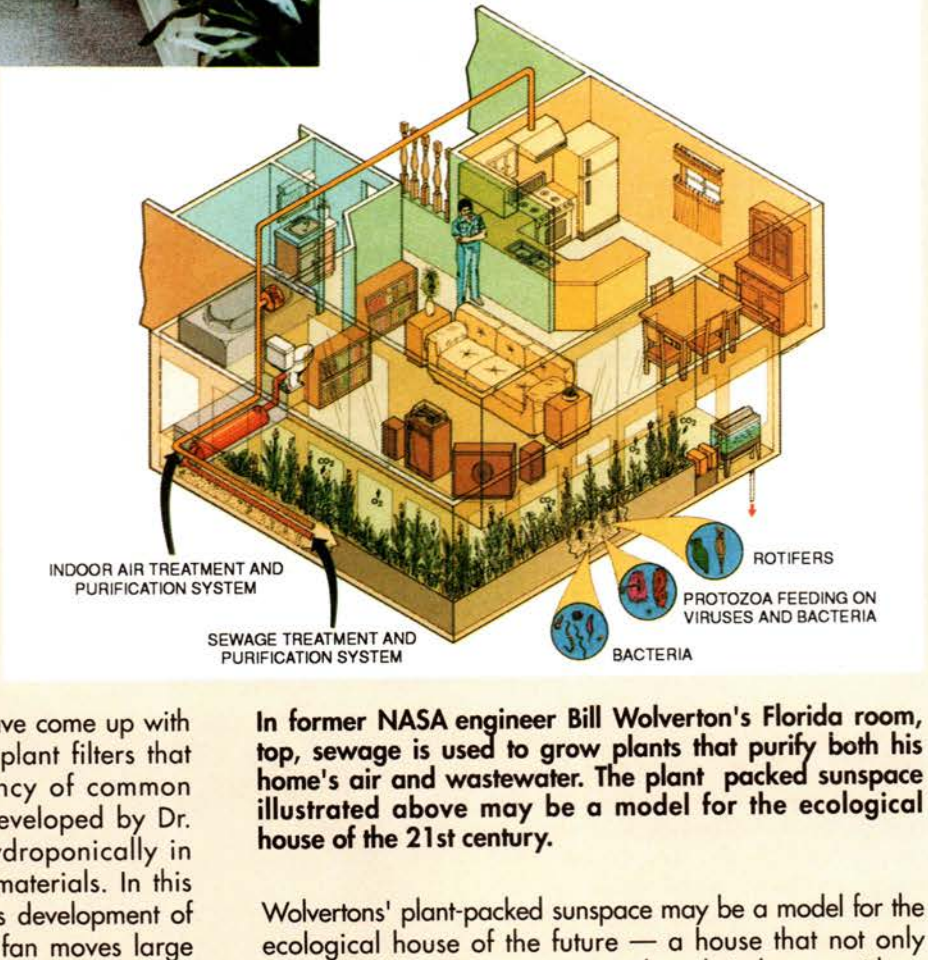
Plants are already playing a vital role in the new environmental houses being built in the States and in Europe. Greenhouse rooms and windows, and in Europe "wintergartens," have become popular in the past five or 10 years. These glazed sunspaces collect solar heat, insulate against noise, and provide a bright, sunny place to relax. They blur the line between nature and architecture, and increasingly are being used to produce food — food you know isn't tainted with pesticides.

Plants are destined to play an even more vital role in the house of the 21st century. In its recent *Report to Congress on Indoor Air Quality,* the Environmental Protection Agency, no hotbed of radical design, emphasized the need for architects to integrate pollution-control systems in their buildings. One way to do that, as NASA put it in a recent study, is to copy "nature's life-support system" — in other words, design with plants.

Bill Wolverton, an environmental engineer, and his colleagues at NASA have come up with preliminary designs for bioengineered plant filters that enhance the pollution-control efficiency of common houseplants. In one version recently developed by Dr. Wolverton, houseplants are grown hydroponically in activated carbon and other adsorbent materials. In this filter, which evolved from Dr. Wolverton's development of plant systems for sewage treatment*, a fan moves large volumes of contaminated air through the carbon bed, where pollutants such as cigarette smoke and organic chemicals are trapped. Plant roots and their associated microorganisms then break down the pollutants and eventually convert them into plant tissue.

Dr. Wolverton has designed such plant filters on a large scale. One system for energy-efficient condominiums pumps indoor air through an activated-carbon and houseplant filter in a greenhouse window. Another design for energy-efficient single-family homes consists of activated-carbon and houseplant filters in two huge greenhouse windows connected to the house's central heating and air-conditioning system.

But the ultimate plant filter is at Bill Wolverton's own home in Picayune, Mississippi. The greatest challenge of his 30-year career, according to Dr. Wolverton, was convincing his wife that he could flush sewage into their Florida room and use it to grow plants to purify both their indoor air and their wastewater without creating an odor problem. His next major obstacle was convincing her that American chameleons, small green lizards, would do a nifty job of keeping plant pests under control. His persistence paid off. The Wolvertons' plant-packed sunspace may be a model for the ecological house of the future — a house that not only allows homeowners to superinsulate their homes without worrying about the buildup of toxic air pollutants, but also reduces the need for the huge, cranky, conventional sewage treatment plants that are a significant source of water pollution from coast to coast. — *Janet Marinelli*


INDOOR AIR TREATMENT AND PURIFICATION SYSTEM
SEWAGE TREATMENT AND PURIFICATION SYSTEM
ROTIFERS
PROTOZOA FEEDING ON VIRUSES AND BACTERIA
BACTERIA

In former NASA engineer Bill Wolverton's Florida room, top, sewage is used to grow plants that purify both his home's air and wastewater. The plant packed sunspace illustrated above may be a model for the ecological house of the 21st century.

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*See "After the Flush: The Next Generation," **GARBAGE** January/February 1990.

four spider plants would be needed to clean the room's air, as they're somewhat less efficient.

Dr. Wolverton currently uses one plant per 100 square feet as a rough rule of thumb. Critics contend it's impossible to pinpoint the number with that degree of precision.

In all fairness, NASA has never claimed to have all the answers. Here's how Bill Wolverton and Dr. Willard L. Douglas, a NASA research chemist, wrapped up an article on their plant research in the trade journal *Interior Landscape Industry* last year: "We would once again like to emphasize that the data presented in this report is only preliminary. Compared to the total amount of research needed, only the surface has been scratched. Yet the results are encouraging, and we feel that future results will provide an even stronger argument that common indoor plants can be a very effective part of a system used to provide pollution-free homes and workplaces."

• TO PLANT OR NOT TO PLANT....

So what are we ordinary folk supposed to make of this war of words among the experts?

Well, I know what I make of it. Seems to me it's common sense to avoid using household products apt to offgas toxic substances in my apartment. At lumberyards, I steer clear of flakeboard, fiberboard, and other formaldehyde-laden pseudowoods. I keep my gas stove in shape. And I've already made one expedition to Manhattan's Flower District for some houseplants.

I'm having a great time reacquainting myself with old buddies like English ivy (this time in topiary form). I've now got a great excuse to run to the nearest sidewalk grocer for some potted mums. I've got big plans for a greenhouse window in the parlor. Let's see, I spend a lot of time in my bedroom/home office, too, so I'll put a few Gerbera there, and perhaps a bamboo palm to cast a leafy canopy over the bed.

Do I care whether *all* the results are in? Do I need to know that exactly 8.235 snake plants will purify the air in my New York City co-op? Heck no. This new information is all I needed to bring back my houseplants – and I'm having fun.

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Philodendron oxycardium

Common name: heart-leaf philodendron (also goes by the botanical name *Philodendron cordatum*)

Description: Mother Nature couldn't have designed a more amenable houseplant. This vine, native to South American tropical forests, meekly accepts blazing sun or a dim corner (some happy medium is best). It'll put up with dry air or humid, hot or cold (even chilly air conditioning) with aplomb. You can plant it in a pot, twirl it around a column, train it up a wall, or suspend it from the ceiling. You can even get away with forgetting to water from time to time. However, you won't win any rare-plant awards: This climber with glossy, deep green, heart-shaped leaves 5 or so inches long (top right in photo) is the most popular philodendron in America.

How to grow: Everything in moderation.

Philodendron selloum

Common name: lacy tree philodendron

Description: Some philodendrons climb, some are arborescent, with sturdy, self-supporting trunks. This is one of the latter upright types. Its huge leaves — up to 3 feet — are deeply indented (so hurricanes in their native tropics don't whip them to shreds). Like its climbing cousin, this lusty philodendron isn't too demanding, but it can easily take over the den or other smallish space.

How to grow: Like all philodendrons, this one is perfectly happy with standard potting soil with good drainage, average house temperatures, good light but not strong midday sun, and some humidity.

Sansevieria trifasciata 'Laurentii'

Common names: Bowstring hemp, snake plant, mother-in-law's tongue

Description: "First nickname comes from use of tough fibers in leaves as bowstrings; second comes from banding or mottling on leaves that causes them to resemble snakeskin; third probably comes from toughness of leaves and plants' persistence under neglect" is how one book explains the monikers. You're either gonna love this plant or loathe it. The snake plant's tall, stiff, swordlike leaves grow straight up. In the wild, they can reach a height of 5 feet; indoors, usually 3 to 4 feet. Large clumps can be quite impressive. Once in a blue moon they'll flower, sending up spikes of small, greenish-white, fragrant flowers.

How to grow: If you feel crushed when plants go kaput, try this one — it's almost impossible to kill. It'll tolerate downright dim light and lackadaisical watering and still won't shrivel up and die.

Spathiphyllum 'Mauna Loa'

Common name: peace lily, spathe flower

Description: This plant's unfurling fragrant white flowers, or spathes, sometimes more than 4 inches wide and 6 inches long, look a lot like those of the calla lily. Best of all, it flowers profusely indoors, even in relatively low light. It's even handsome when not in bloom, with large, dark green, ovalish leaves that narrow to a point.

How to grow: This is one of the easiest large flowering houseplants. It'll survive in average house temperatures and humidity and low (reading-level) light. But if you want it to bloom, give it bright light (no direct hot sun), and keep it moist. — *Janet Marinelli*

TOXIC TRASH:

Drawing by Madelaine Thatcher from *The American House* by Mary Mix Foley. Harper & Row.

MINIMIZING HOUSEHOLD HAZARDOUS WASTE

by Ginia Bellafante

In a country where using spotted drinking glasses is tantamount to social sin, it's no wonder that household chemicals are turning out to be a big environmental problem. Every year we want our glasses to be more sparkling and our bug sprays to be more lethal. Trouble is, many common household products contain a variety of toxins that can cause not only health problems during use and storage, but also environmental damage once they're tossed away. Let's put aside, for now, the "overkill" products that merely put a strain on the environment but aren't classified as toxic. *The average American household generates 15 pounds of hazardous waste per year*. Most of it goes into local landfills, sewage-treatment plants, and septic tanks — all ill-equipped to handle toxins safely. An estimated 1.6 million tons of household hazardous waste exist in the municipal waste stream right now.

Until recently, we didn't pay much attention to hazardous *household* garbage. Maybe we were too busy bemoaning the dangers of toxic industrial wastes. Maybe we thought a few cups of paint poured down the drain every two or three years couldn't make *that* much difference. They do make a difference. For example, a 1989 study of lead and cadmium by the U.S. Environmental Protection Agency (EPA) concluded that nickel-cadmium batteries, the kind used in small appliances and electronic devices, were the largest source of cadmium (a heavy metal that may cause lung and circulatory-system damage) in the waste stream.

Disposal of industrial hazardous waste is regulated by the EPA (with mixed results) under the Resource Conservation and Recovery Act. However, the disposal of household hazardous waste is left entirely to you and me.

• WHAT'S TOXIC?

The EPA defines a hazardous substance as one that is flammable, corrosive, toxic, or radioactive. The Water Pollution Control Federation, an organization representing wastewater engineers and other professionals, has identified seventy such substances.

Hazardous household products typically fall into one of five major categories: paints and solvents, including strippers and thinners; vehicle fluids such as motor oil, brake and transmission fluid, and antifreeze; pesticides; household cleaners and polishes; and miscellaneous items such as batteries, art supplies, pharmaceuticals, and some cosmetics.

Because the toxic substances in most household products are not clearly listed on product labels, trying to figure out what makes a particular product hazardous is confusing at best. Not all household cleaning agents, for example, are required to list their ingredients on the labels.

At the very least, products designated as hazardous by the EPA must list "signal words" on labels. Hazardous non-pesticide products must say "danger" if they are extremely flammable, corrosive, or toxic. Highly toxic substances must also include the word "poison" on the label. The signal words "warning" or "caution" are supposed to be used on all other hazardous products. The principal hazard involved in using any product – typically irritation to the skin, eyes, or gastrointestinal system – must also be made clearly visible on the label. What labels *don't* provide you with is information on the chronic or long-term effects of exposure to these substances, or suggestions for safe disposal.

Even before they start causing problems in the municipal waste stream, the powerful toxins commonly found in household products contribute to indoor air pollution, and potentially to poor health.

Solvents, synthetic organic or carbon-based compounds, are some of the most worrisome and frequently found toxins in household maintenance products. They exist in high concentration in many aerosols and cleansers, polishes, paints, strippers, thinners, stains, caulks, adhesives, and glues. Because many of the organic compounds are volatile, they can contaminate indoor air and linger for days after use. The health effects of these substances range from headache, dizziness, and nausea to cancer in some cases, depending on length and frequency of exposure. Methylene chloride, a chemical solvent ubiquitous in consumer products, has been cited by the federal Consumer Product Safety Commission as "one of the highest cancer risks ever calculated for a chemical in a consumer product." Other potent organic chemicals including phenols are commonly used in disinfectants.

Heavy metals, which have a similarly wide range of health effects, are another major class of toxins in household and automotive products. For example, lead is a primary component in car batteries. Cadmium is often used in rust proofers.

Look familiar? Toxic products line workshop, garage, and basement shelves in most homes.

• DISPOSAL PROBLEMS

Once people realize the health risks involved in keeping hazardous chemicals around the house for a long period of time, they typically head for the trash can or sink to get rid of them. Not suprisingly, that can lead to a slew of problems.

On route to the landfill, hazardous household waste can cause injuries to sanitation workers and damage to equipment. According to a 1982 California study, three percent of the garbage collectors in that state were hurt as a result of coming into contact with hazardous waste that had been tossed in residential trash cans. Chemicals can react with other substances in household trash, causing fire and explosion in trucks or waste-handling facilities.

Once at the landfill, the toxins in hazardous household products can combine with rainwater and other liquids to form a particularly poisonous leachate, which may seep through the soil and contaminate groundwater. Only one-quarter of

continued on page 47

A GUIDE TO HOUSEHOLD TOXICS

PRODUCTS	TOXIC INGREDIENTS	HUMAN HEALTH EFFECTS OF NORMAL USE*
Oil-based paints	Pigments, ethylene, aliphatic hydrocarbons, fungicides	Irritating to skin, nose, eyes, throat; may induce dizziness, headache, and nausea; prolonged exposure via inhalation may lead to liver, kidney, or respiratory damage, nervous-system disorders, birth defects, and possibly cancer
Thinners	N-butyl alcohol, acetone, methyl isobutyl, ketone, petroleum distillates	See "Oil-based paints"
Strippers	Acetone, methyl ethyl ketone, alcohols, xylene, toluene, methylene chloride	See "Oil-based paints"; methylene chloride is a known cancer-causer
Stains/Finishes	Petroleum distillates, glycol ethers, ketones, halogenated hydrocarbons, naphtha	See "Oil-based paints"
Wood preservatives	Chlorinated phenols, creosote, arsenic compounds	See "Oil-based paints"; creosote and arsenic compounds are known cancer-causers
Metal primers	Methylene chloride, petroleum distillates, toluene	See "Strippers"
Pesticides **(synthetics & botanicals)**	Wide range of toxic ingredients, including organophosphates, carbamates, chlorinated hydrocarbons	Most are irritating to skin, eyes, nose, and throat; may induce dizziness, headache, and nausea; prolonged exposure via inhalation may lead to liver, kidney, or respiratory damage, nervous-system disorders, birth defects, or possibly cancer
Drain openers	Potassium or sodium hydroxide (lye), hypochloric acid, petroleum distillates	May cause severe burning to eyes and skin
Oven cleaners	Potassium or sodium hydroxide, ammonia	May cause severe burning to eyes and skin; exposure to ammonia via inhalation may irritate lungs
Floor & furniture polish	Diethylene glycol, petroleum distillates, nitrobenzene	Irritating to skin, eyes, nose and throat; may induce vomiting, shallow breathing if inhaled or absorbed through skin; prolonged exposure may lead to liver, kidney, or blood damage
Disinfectants	Diethylene or methylene glycol, sodium hypochlorite, phenols, cresol	Prolonged exposure via inhalation may lead to liver or kidney damage, or possibly cancer.
Mothballs	Paradichlorobenzene	Irritating to nose, throat, and lungs; prolonged exposure may induce depression, kidney, or liver damage
Batteries (household)	Cadmium, lithium, mercury	Toxic only if swallowed
Batteries (automotive)	Lead, sulfuric acid	Sulfuric acid may cause blindness upon contact
Motor oil	Hydrocarbons, e.g. benzene; heavy metals	See "Oil-based paints"
Antifreeze	Ethylene glycol	Irritating to eyes and skin; may induce dizziness, headache, and nausea if inhaled; may cause abdominal pain if absorbed through the skin
Pharmaceuticals	Ask pharmacist or physician	Ask physician
Personal-care products **(aerosol deodorants and hairspray, nail polish, nail-polish remover)**	Hairspray – aerosol propellants, formaldehyde Nail polish – formaldehyde, phenol, xylene, toluene Nail-polish remover – acetone	Deodorants and antiperspirants may cause skin irritation; solvents in nail polish and nail-polish remover may cause dizziness or nausea when inhaled; formaldehyde is a suspected cancer-causer

SAFE DISPOSAL	LESS TOXIC ALTERNATIVES
Take to a local paint-exchange program, or household-hazardous-waste collection event for recycling	Latex or milk-based paints, plant-and wood-oil based paints (See KEEPERS, Nov/Dec 1989)
Pour soiled thinner into a clean container, let solids settle and funnel liquid into a second container; save settled "sludge" for collection, re-use remaining liquid thinner	Water with water-based paints
Take to collection event or donate to local furniture refinisher	Sandpaper, heat gun, water-based strippers
See above	Latex paint or natural earth pigment finishes
Take to collection event	Water-based wood preservatives, rot-resistant wood
See above	Unknown
See above	Physical barriers, and natural biological controls (See indoor-pest control article, page 22)
If served by a municipal sewer system, dilute and pour down the drain; if served by a septic system, pour *small* dilute amounts down the drain over the course of a few days	Plunger, handful of baking soda and 1/2 c white vinegar
See above	Baking soda, water, scouring pad
Take to collection event	One part lemon juice, two parts vegetable oil
Dilute and flush down the drain if served by a municipal-sewer system	1/2 c borax in one gallon hot water
Store in air-tight containers until collection event	Cedar chests or closets, cedar chips
Take back to a retailer who collects batteries for re-processing, or take to collection event	Rechargeables, electric current
Take to a service station that ships batteries to a recycler, or take to a collection event	Unknown
Take to a service station for recycling, or to a collection event	Unknown
Call your municipal sewage facility to see if it is equipped to break down antifreeze. If it can, pour small dilute amounts down the drain	Unknown
Pour dilute over-the-counter liquid medications down the drain, throw over-the-counter solids in the trash, turn prescription drugs in to collection program	Ask pharmacist or physician
Throw aerosol cans containing no fluids or pressures, and dried out nail polish into the trash; save nail-polish remover for collection event	Chemically simple non-aerosol deodorants, natural cosmetics

*All product ingredients are harmful or fatal if swallowed

continued from page 45

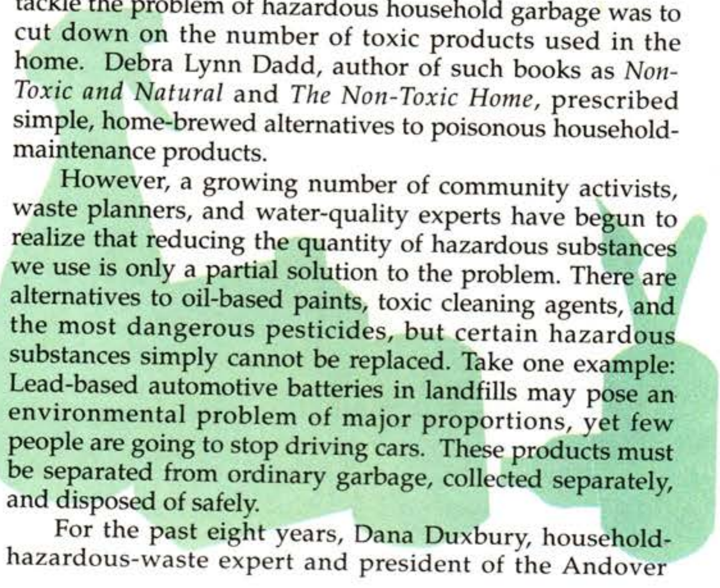
municipal landfills in this country have groundwater-monitoring programs, and a paltry five percent have leachate collection systems which prevent toxins from getting into groundwater. Landfills that house hazardous waste are also a significant source of toxic air pollution.

Toxic household products are a problem when poured down the drain too. Although municipal sewage systems often have commercial facilities and small industries plumbed into them, most wastewater comes from households. Studies conducted by the EPA and the National Science Foundation have found heavy metals like cadmium, mercury, lead, and nickel in domestic wastewater, as well as solvents, paint thinners, and degreasers such as tri- and tetrachloroethylene, methylene chloride, benzene, and toluene. Yet the vast majority of municipal sewage-treatment plants are not equipped to treat hazardous waste. Consequently, the toxins contaminate sewage sludge or are simply discharged into waterways, where they can contaminate aquatic food chains.

To demonstrate the effect that even a relatively small amount of a highly hazardous substance can have in a liquid waste stream, David Galvin, a senior water-quality planner for the city of Seattle, made an interesting point. "A pint of mercury brought into a Seattle-area pick-up program," he said, "would have contaminated the entire area's sewage system had it been poured down the drain. It would have caused violations of effluent [discharge] limits, and contaminated sludge—even in Seattle's largest 125-million-gallons-per-day plant."

For homeowners dependent on septic systems to treat wastewater, tossing household chemicals down the sink can present even greater problems. Organic chemicals can pass right through septic tanks and drainfields into groundwater, often the home's source of drinking water. According to a 1984 EPA study, "Of all groundwater pollution sources, septic-tank systems, and cesspools rank highest in total volume of wastewater discharged directly to soils overlying groundwater and they are the most frequently reported sources of contamination."

• WHAT SHOULD BE DONE



Ten or so years ago, many experts believed the only way to tackle the problem of hazardous household garbage was to cut down on the number of toxic products used in the home. Debra Lynn Dadd, author of such books as *Non-Toxic and Natural* and *The Non-Toxic Home*, prescribed simple, home-brewed alternatives to poisonous household-maintenance products.

However, a growing number of community activists, waste planners, and water-quality experts have begun to realize that reducing the quantity of hazardous substances we use is only a partial solution to the problem. There are alternatives to oil-based paints, toxic cleaning agents, and the most dangerous pesticides, but certain hazardous substances simply cannot be replaced. Take one example: Lead-based automotive batteries in landfills may pose an environmental problem of major proportions, yet few people are going to stop driving cars. These products must be separated from ordinary garbage, collected separately, and disposed of safely.

For the past eight years, Dana Duxbury, household-hazardous-waste expert and president of the Andover

FOR MORE INFORMATION

The following organizations are excellent sources of information on hazardous household wastes, alternative products, and community collection programs.

Dana Duxbury and Associates
Waste Watch Center
16 Haverhill Street
Andover, MA 01810
Write for free quarterly newsletter, "Household Hazardous Waste Management News"

Household Hazardous Waste Project
901 South National Avenue
Box 108
Springfield, MO 65804
Send $8.00 ($8.49 for Missouri residents) for a 178-page booklet containing information on the hazards of common chemical substances and safer alternatives.

San Francisco Household Hazardous Waste Program
Room 271
City Hall
San Francisco, CA 94102
Send a $1 check to: The City and County of San Francisco for chart "Garbage Cans & Garbage Can'ts"

Clean Water Fund
New Jersey Environmental Federation
808 Belmar Plaza
Dept. GM
Belmar, NJ 07719
Send $2 for chart on alternatives to toxic household products

Books:
The Healthy Home by Linda Mason Hunter, Rodale Press, 1989
The Nontoxic Home by Debra Lynn Dadd, Jeremy P. Tarcher, Inc., 1986
Nontoxic & Natural by Debra Lynn Dadd, Jeremy P. Tarcher, Inc., 1984

Massachusetts-based environmental consulting firm Dana Duxbury and Associates, has been instrumental in helping communities set up toxic-home-product management systems. "When dealing with household hazardous waste," she points out, "we have the past, present, and future to deal with. We have to safely manage the waste we've already created." Her approach is to combine public education on hazardous household waste with community- or state-sponsored collection programs.

Special collections for toxic household wastes are indeed beginning to catch on. Approximately 2,000 programs have been established in 45 states since 1981. Some communities have sponsored periodic one-day collections. More ambitious communities have established permanent facilities where residents can drop off hazardous trash. Specialty programs that target the collection of a single item such as paint, motor oil, or batteries, are also becoming popular. Almost all programs are sponsored by a public agency, usually at the prodding of a local citizens group.

Hazardous-waste-collection programs typically attract about one to five percent of the residents they hope to serve. The town of Lexington, Massachusetts, has been holding very successful one-day events every year since 1982. Participation has increased steadily since 1986. In 1989 a record-high 35 55-gallon drums of toxic waste were collected.

The state of Minnesota not only holds annual one-day collections and maintains five permanent collection facilities, but also operates a household-hazardous-waste information hotline. An elementary school educational program has also been established, and educational displays have been set up in banks and shopping malls.

The Seattle-King County area recently established an innovative mobile collection unit, which travels to a different neighborhood in the metropolitan area every two weeks.

What happens to toxic household wastes *after* they're collected? We'll discuss this subject in depth in a future issue. For now, suffice it to say that in a few cases, most notably paints and motor oils, they can be recycled. Leftover paints are often mixed together and put through a sieve. The resulting blend, known as "institutional beige," is sold or donated to schools, hospitals, and the like. About 10 percent of the used motor oil collected is re-refined and reused. (The percentage is small because re-refining is still more expensive than producing virgin oil.) When the technology is available, non-recyclable wastes are chemically detoxified, at least partialy. Ultimately, however, they are either landfilled or burned at specially designed facilities. Although these facilities certainly are safer than ordinary landfills and incinerators, there is still no risk-free way to dispose of toxic wastes.

Until the day when there is a perfectly safe solution, we must all be discriminating shoppers and purchase less-toxic alternative products whenever possible. The chart on pages 46 and 47 lists common household products, their toxic ingredients, health effects, and safer alternatives. It also tells you the best way to dispose of toxic household products. If your town doesn't have a collection program, consider setting one up.

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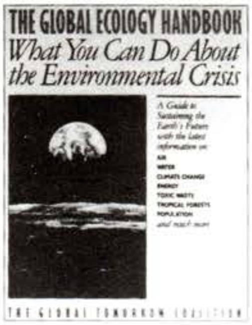

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•Grow your own fruits and vegetables without toxic chemicals, and patronize natural food stores that sell organic produce.

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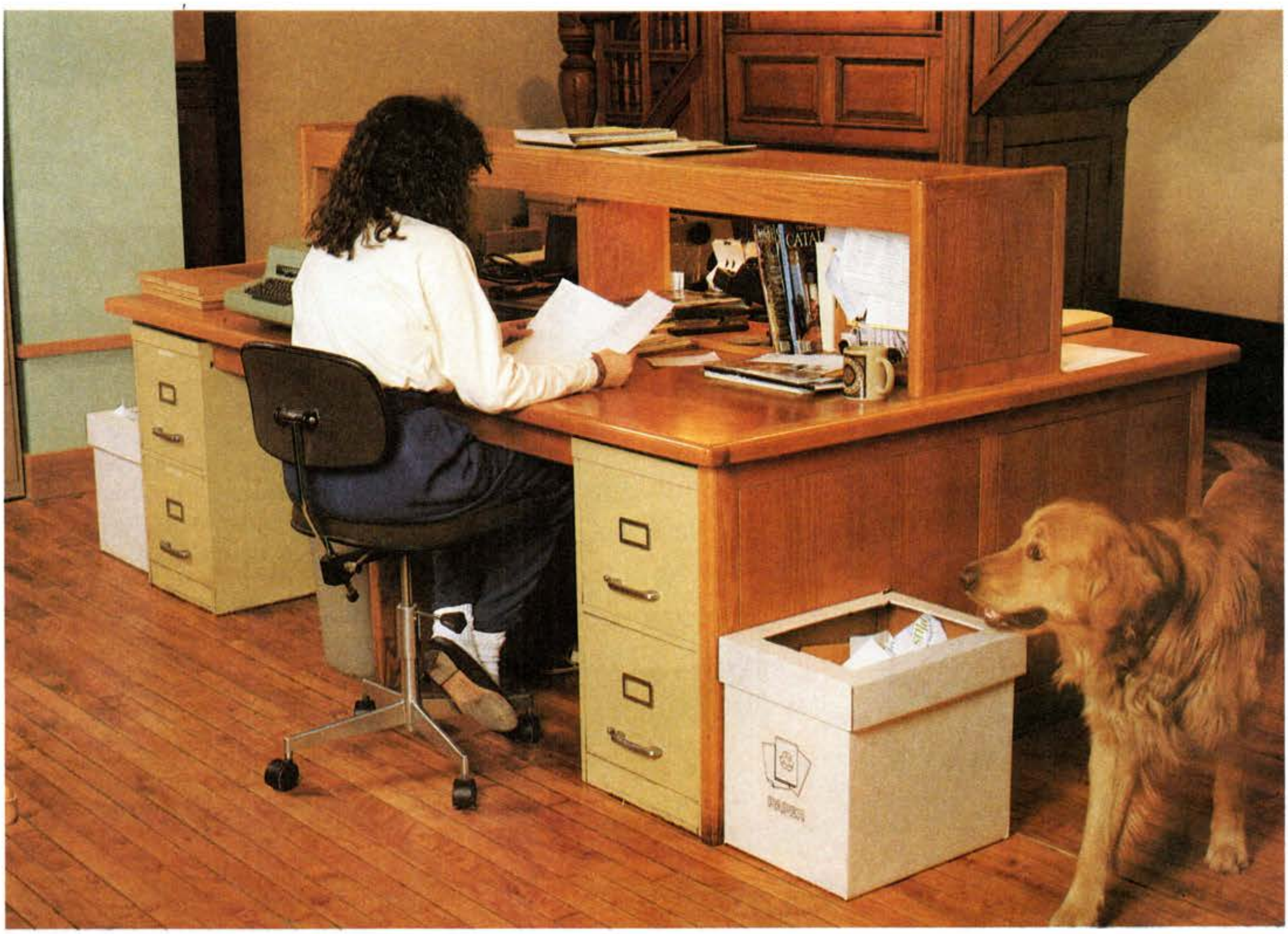

Photos by Donald Betts/Horizon Photographics, Inc.

RECYCLING AT GARBAGE

Deskside cardboard cartons (top) are emptied into appropriate plastic bin (above). Note additional bins for glass.

by Bruno Tedeschi

Like most offices, ours generates "garbage" that's mostly copy and computer paper, stationery and fax paper. (The Environmental Protection Agency estimates that up to 77% of office trash is recyclable paper. I'd say the ratio was closer to 90% in our paper-intensive magazine office.) And like most offices, ours threw all that paper out, promiscuously mixed with newspapers, food garbage, and plastic pens. Off it all went, week after week, to the Fresh Kills landfill, the largest in the world.

The irony was too much for us. We were committed to doing something about it – but it wasn't going to be easy. Like most cities, New York is barely out of the "talking about it" stage of recycling. In our neighborhood, only newspapers are picked up separately, and only from private residences (not offices). While newly recruited

Sanitation Police *carry guns* to enforce recycling in large apartment buildings in test neighborhoods, we couldn't *pay* to have high-quality office paper picked up by the city.

We were on our own.

At a staff meeting one day, I found myself appointed "recycling coordinator." My task: Figure out what to do with the office paper, newspapers, and bottles and cans. Get the program set up throughout the office. Teach staff members to comply.

It started with a phone call to NYC's Council on the Environment, who had sent us literature describing their office-recycling-program design service. No go. The Council typically worked with offices at least five times our size. A representative there gave me helpful advice – get other offices in the building involved, estimate waste generation per person, think about storage space for a lot of paper – but I was still on my own.

No problem, I thought when I turned to the Yellow Pages. Under "waste paper," I found 38 collectors in Brooklyn alone. "Top prices paid," boasted two ads. I called every one of them and every one rejected me. Why? We just don't generate enough. One collector snarled, "Look, kid, just throw the stuff out."

I was fast becoming cynical about our effort to do the right thing, but I did understand the problem. Wastepaper collectors make financial decisions based on real-world economics. They can't afford to come across Brooklyn to pick up our paper unless we have a ton of it for them (literally – that's the minimum for a pickup). That's roughly 200,000 sheets of 8½ x 11 paper, or more than our staff (then 14) generated in a year.

By now, other occupants in the building had said they'd comply if it were easy. I considered how much computer paper we'd generate, to what extent we could sort the paper, and how much storage we'd need to "save up" a ton. Sounding more like a businessman, I made the calls again. Most haulers still weren't interested. A few said okay – if we'd pay them to haul it. (At this point, knowing that there was a paper glut and that we were a small player, we weren't insisting that we get paid for the paper. We just wanted to recycle, and we figured we'd save money by not having to pay our garbage hauler to take the paper portion to the dump, a cost that has gone up every year.) Finally, I found a hauler who would pay us a modest price "depending on market," and who would provide five large canvas hampers to hold paper awaiting pickup in the cellar.

The building owner, realizing that recycling might become mandatory in a few years anyway, readily agreed to provide space for the hampers. The city building department immediately required him to install a sprinkler system and smoke detectors in the cellar.

I ordered cardboard cartons from Diversified Recycling Systems, a Minnesota firm with an extensive, if slightly pricey, line of sturdy products. (Cost: $23.70 for six.) These went at each desk, next to the old wastebaskets. Also from Diversified came 26-gallon plastic bins (3 for $73.45) for intermediate storage: Staffers regularly empty their cardboard cartons into them, and our janitor intermittently empties these into the hampers in the cellar. Because continuous-feed computer paper fetches more money in the recycled market, the collector asked us to separate it out from our other office paper; it goes into its own cardboard carton.

Here's a quick rundown of what's recyclable of our office paper: computer paper, stationery, copy and fax paper, yellow legal sheets, memos, letters, most uncoated paper, envelopes (except the plastic window, which we rip off), and Post-it™ notes (self-adhesive is okay).

Here's what we still toss as garbage: tissue, brown bags, glossy paper (including most magazines and much promotional mail), coated and padded envelopes, smooth and corrugated cardboard, and anything with food or drink residue. (Note: Some paper merchants are now taking glossy paper, which can be recycled but lowers the price of the batch. Check with your own merchant.)

Wastepaper is picked up by a private recycler when celler hampers are full.

New York has a bottle bill, so bottles and cans can be taken back for reimbursement of the deposits (the cash going into our fresh-flower fund). Other times we donate the cans and bottles to a homeless-people's charity.

Newspaper has been our biggest problem. We get three dailies and a few weeklies, shared among the whole staff. Right now no private hauler wants used newsprint – countrywide, curbside collection has created a glut, yet there's no significant increase in market demand for recycled newsprint. We could haul the newspapers to the neighborhood collection site early on Saturday mornings (no volunteers for this task yet – most of us don't own cars). Or we can sneak the papers, bundled and tied, out to the curb in front of a residence for municipal pickup. (Shhh, don't tell the city.)

To be honest, the program hasn't paid for itself yet. But it didn't cost much, either, and it's the right thing to do, and now we won't have to scramble when recycling becomes mandatory.

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KEEPERS

ANTIDOTES TO THROWAWAYS

Reviewed by Hannah Holmes

Cotton Shower Curtain

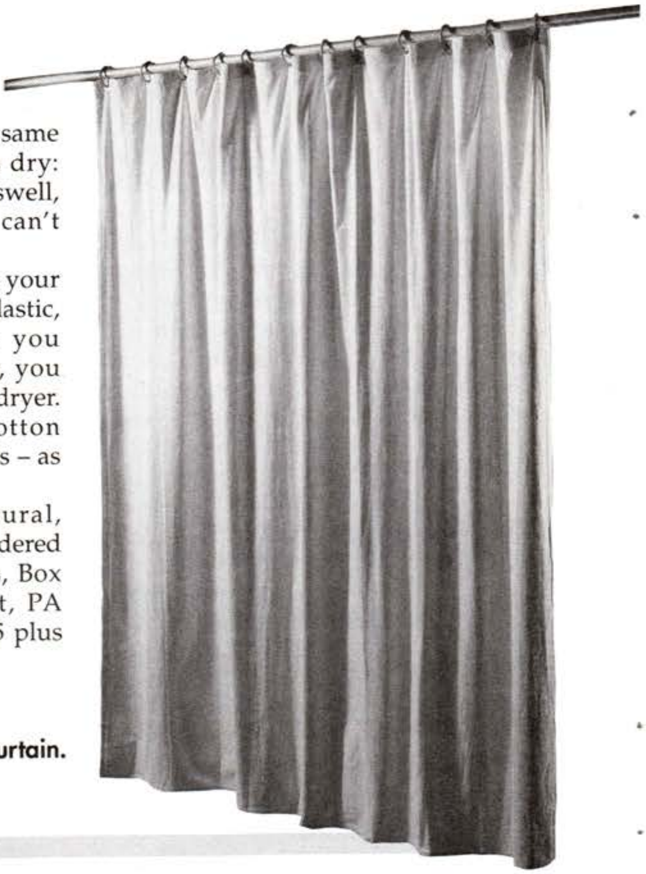
Ever wonder about that stand-back odor coming from your new shower curtain? Many shower curtains are made from polyvinyl chloride. Like other plastics, PVC is made from petroleum derivatives, with other substances such as chlorine mixed in. Some of these substances "offgas," or vaporize, for months and are inhaled, causing problems for chemical-sensitive people.

Besides smelling bad, the manufacture of plastic shower curtains uses up non-renewable petroleum and, like other plastics, they don't readily degrade into environmentally useful components.

You may have thought that cotton shower curtains went the way of the horse-drawn buggy, but they are still available from a Pennsylvania company. The canvas shower curtains keep your bathroom floor dry the same way canvas tents keep campers dry: When the threads get wet, they swell, tightening the weave so water can't seep through.

Cotton curtains won't assault your nose, and they're heavier than plastic, so they won't attack you as you shower. When they get grungy, you can toss them in the washer and dryer. And, like cotton diapers, cotton curtains have numerous after-lives – as car covers, rags, or whatever.

Available in white and natural, cotton shower curtains can be ordered from Non-Polluting Enterprises, Box 333GA, Dept. GM, Smethport, PA 16749; (800) 782-NOPE. Send $25 plus $3.50 for shipping.



The classic cotton shower curtain.

Hazardous Waste Wheel

Known affectionately as the "EHMI (pronounced *eemie*) wheel" by household-hazardous-waste experts, this cardboard contraption, made by the nonprofit group Environmental Hazards Management Institute (hence the name), alerts you to the noxious stuff you may have under your sink or in the basement or garage.

Spin the wheel and you get a list of hazardous ingredients, potential hazards, and safer alternatives to dozens of products, including antifreeze, flea collars, photographic chemicals, and furniture polish.

The wheel also tells you how to safely dispose of these products. Some, like latex paint, can be dried out and thrown in the trash. Others, like pool chemicals, should be stored until a community collection program for household toxics is organized. In some cases, the wheel tells you to consult your local waste-management agency; because disposal services vary in different areas of the country, this is good advice.

The EHMI Wheel is available for $3.75 ppd. from Environmental Hazards Management Institute, P.O. Box 932, Dept. GM, Durham, NH 03824; (800) 446-5256.

The "eemie wheel" guide to toxic household products.

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Air Cleaners

Air in the Great Outdoors can be bad, but indoor air is often worse. A recent U.S. Environmental Protection Agency study concluded that indoor air may be two to five times more polluted than outdoor air, depending on where you live. Besides the formaldehyde and other chemicals offgassed by your furniture, carpeting, wall board, and dry-cleaned clothes, you may be breathing particulates, or particles of smoke, pollen, and dust. For people with dust or pollen allergies, or who live with a smoker, air cleaners may be part of the solution to indoor air pollution. They suck in dirty air, clean it, then blow it back into the room.

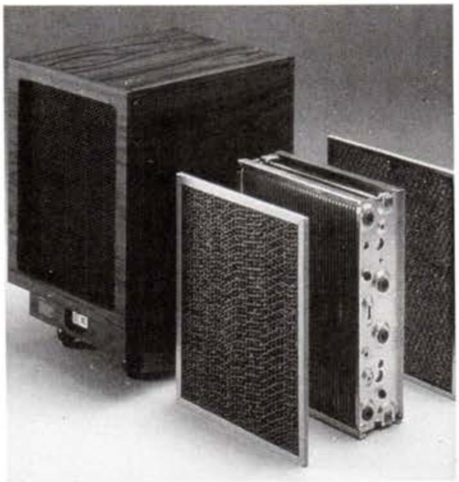
The EPA does credit well-designed air cleaners with removing smoke, dust, and pollen from the air, but cautions that home air cleaners are not effective against gaseous pollutants. And the agency notes that air cleaning is most effective when integrated into a central air-circulation system.

Air cleaners work by trapping particulates in different ways. Many use a combination of technologies.

Electrostatic precipitators charge the air with electricity as it enters the unit. The charged particulates cling to polarized metal plates that comprise the precipitator. In the best models, the precipitator can be taken out and washed in a dishwasher.

Ionizers electrically charge the air molecules around them. The charged air then attracts particulates to the air cleaner, which traps them with a filter or electrostatic precipitator.

There are several types of air *filters*. HEPA (high-efficiency-particulate-arresting) filters are made of fine, packed fiber. They may last a year or more, but are expensive to replace. Electret filters, filters with a bi-polar electrical charge, are charged during manufacture so that they'll trap charged particles in the air. Carbon filters are intended to trap odors and gases – however, the EPA says that neither these nor other typical air cleaners are much use for radon or volatile organic compounds such as formaldehyde, especially over a long period of time. Before you buy, ask about the filter-replacement schedule and the cost of replacements.



The floor-model Honeywell F59A.

Another consideration is how fast an air cleaner can clean a room. The clean-air delivery rate (CADR) tells you how many cubic feet the product can clean in a minute; the bigger the room, the higher CADR you will need.

Since central air-cleaning systems are extremely expensive, we've focused on floor and tabletop models. Although some weigh more than 40 pounds, they're still portable, so you can use them in the living room during the day, then take them to the bedroom at night. But be sure to consider noise levels if the air cleaner will be spending its nights in your bedroom. Listen to the fan at all its speeds before you buy. Incidentally, air cleaners aren't energy hungry. Even floor models often use less energy than a 60-watt light bulb.

In 1985 the Association of Home Appliance Manufacturers began to certify air cleaners. Separate CADRs for dust, smoke, and pollen removal are on the AHAM seal. For a list of certified units, send a self-addressed, stamped envelope to: Association of Home Appliance Manufacturers, Room Air Cleaner Certification Program, 20 North Wacker Dr., Dept. GM, Chicago, IL 60606.

Following are a few units with good reputations.

Floor Models

Smokemaster P600, $469: An electrostatic precipitator with a prefilter and carbon filter ($9.50), and a CADR of 600 cubic feet per minute. Available through dealers, or direct from:

Air Quality Engineering
3340 Winpark Dr., Dept. GM
Minneapolis, MN 55427
(800) 328-0787

Honeywell F59A, about $500: An electrostatic precipitator with a prefilter, carbon filter ($30), and a CADR of 330. Available through dealers. For more information write:

Honeywell, Inc.
1985 Douglas Dr. North, Dept. GM
Golden Valley, MN 55422

Enviracare EV1, $299: A HEPA filter, with charcoal ($9.25), and a CADR of 300. Replacement HEPA filters are $69.95 ppd. Available through dealers, or direct from:

Enviracare Corp.
747 Bowman Ave., Dept. GM
Hagerstown, MD 21740
(800) 332-1110

Table-Top Model

Bionaire BT-1000, about $300: An ionizer with an electret filter, a prefilter and a charcoal filter ($4), and a CADR of 120. Available through dealers, medical-supply stores, and department stores.

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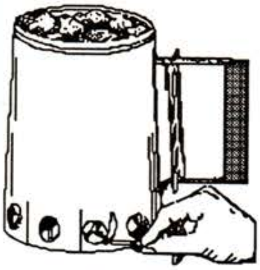

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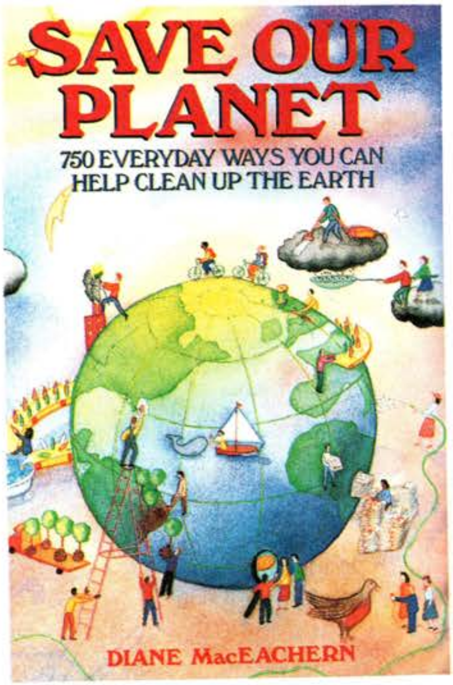
Numerous environmental guides are appearing at the bookstore in time for Earth Day 1990. Here are the most comprehensive and readable among them.

Save Our Planet: 750 Everyday Ways You Can Help Clean Up The Earth

by Diane MacEachern. 207 pages. Dell Readers Service, P.O. Box 5057, Des Plaines, IL 60018. Softcover $11.95 ppd.


SAVE OUR PLANET
750 EVERYDAY WAYS YOU CAN HELP CLEAN UP THE EARTH
DIANE MacEACHERN

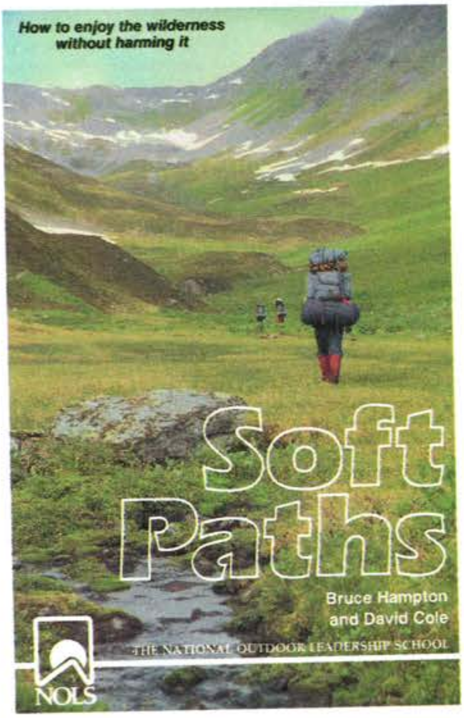
More than a consumer guide, *Save Our Planet* is a blueprint for a new awareness, and a handbook for community activists. Not that consumer guidelines are missing – Ms. MacEachern names fuel-efficient cars, organic fertilizers, and other products. But her philosophy goes beyond deciding what to leave on the supermarket shelves. "Borrow or rent items you don't use that often. In other words, buy less." Between the lines is her belief that neighborhood efforts on behalf of the environment build a community spirit that also improves the *social* ecology.

The 750 tips are divided into nine categories – home, garden, garage, supermarket, school, office, community, apartment, and vacation. Each chapter closes with a "check-chart": Problems (global warming, deforestation, water pollution, etc.) are listed on one side, and possible solutions (buy in bulk, don't buy aerosols, eat less meat) on the other.

Among the tips, Diane MacEachern scatters "Bright Ideas"— case histories. Rockford, Ill., for example, encourages recycling by opening one garbage bag each week, and paying the household that filled it $1000 if no aluminum or newspaper is found. Each chapter also includes charts on the disposal of hazardous household wastes, as well as source boxes.

Soft Paths: How to Enjoy the Wilderness Without Harming It

by Bruce Hampton and David Cole, illustrated by Denise Casey. 173 pages. Stackpole Books, Cameron and Kelker Streets, P.O. Box 1831, Harrisburg, PA 17105. Softcover $12.45 ppd.


How to enjoy the wilderness without harming it
Soft Paths
Bruce Hampton and David Cole
THE NATIONAL OUTDOOR LEADERSHIP SCHOOL
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This book unflinchingly maps out the hazards of entering a wilderness area – the primary one being that any human presence there will detract from wildness.

Sound grim? It doesn't have to be, say Mr. Hampton and Mr. Cole, who wrote the book for the National Outdoor Leadership School. If the authors had their way, every camper would feel like the first person to find a way across the stream, the first person to camp in the wild meadow. But this requires that every hiker hide his or her tracks.

What *Soft Paths* presents is a wildland ethic: Where there is a maintained path, use it and spare the wilderness around it. Where there is none, avoid walking in the same place twice. (The next hikers may follow in your tracks, and an informal trail will begin cutting its way across the wilderness.) This ethic also applies to the way you break camp (rake the grass back to normal with a branch), and the way you scatter your fire (if you must have one).

For every terrain, there is a method for the lowest impact. For deserts, tundra, mountains, forests, and waterways, there are preferred ways to set up a tent, cook, even dispose of waste and toilet paper.

The Green Consumer

by John Elkington, Julia Hailes, and Joel Makower. 374 pages. Viking Penguin Inc., 40 West 23rd St., New York, NY 10010-5290. Softcover, widely available for $8.95.

From apples to Zia Cosmetics (they're environmentally friendly), the book discusses the environmental impact of many products and habits.

Despite the enormous number of subjects covered, the discussions are far from shallow. There are 12 pages of instructions for "green driving," for instance, covering car maintenance, alternative fuels, carpooling, car-related hazardous waste, fuel-efficient cars, and how driving styles can reduce pollution and conserve fuel. The same attention is given to household cleansers. The toxic ingredients found in many commercial brands are described, alternative "green" brands are listed, and recipes for home-made cleansers and pest controls are offered, too.

If you're ready for some advanced reading, you can flip to the section called "The Green Bookshelf" and browse through the 100 titles listed. Or you can get into the action by joining one of the 164 environmental organizations listed.

– Reviews by Hannah Holmes

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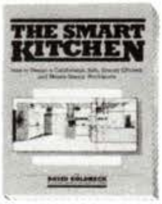

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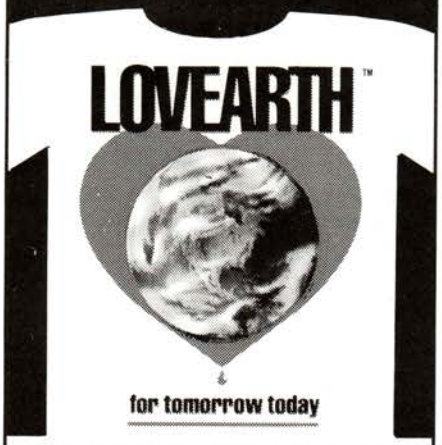

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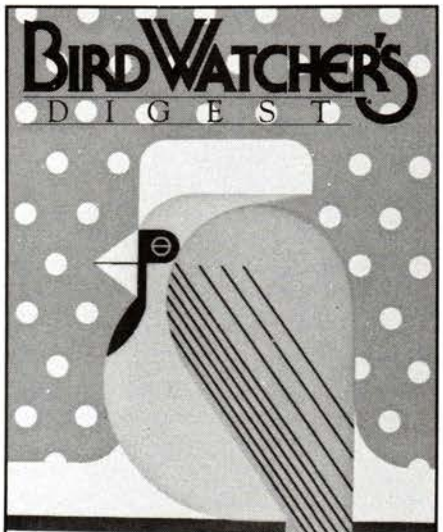

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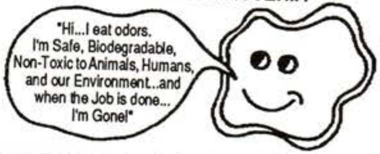
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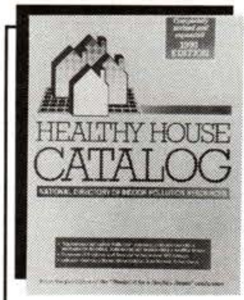
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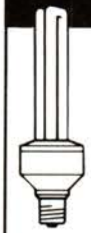

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When convenience is a dirty word

Donald Betts/Horizon Photographics, Inc.

We used to be content combatting household slime and grime with a bucket of Spic and Span and water. Then we turned to a variety of pumped and sprayed liquid cleansers. And now we have Spiffits.™

Spiffits is the kind of product that makes "convenience" a dirty word. Introduced late in 1988 by DowBrands, Spiffits is a line of chemically treated, polypropylene towelettes for household cleaning. Each of five varieties is formulated to tackle a different job: bathroom, glass, furniture, soft scouring, and multi-purpose.

Reports on how well Spiffits sells are mixed, but Dow says it hopes to create a $100 million market in moist towelettes. (Household cleaners now constitute a one-billion-dollar-a-year market.) When the trade magazine *Advertising Age* asked Dow to comment on their new product, which retails for about $3.60 for 24 wipes, group development manager Susan Crow explained that "the core of the concept is one-step cleaning." According to Crow, Spiffits "is particularly relevant for today's working women who have less time to clean and are willing to pay a premium price for convenience."

What does "convenience" mean, anyway? For the sake of argument, let's compare Spiffits (and others of the same genre) to, say, Spic and Span. Spic and Span comes in an unlined, recycled-paperboard box. Spiffits comes in hard PVC plastic boxes.(As part of a five-year plan to use more post-consumer material, Dow says it may package Spiffits in recycled plastic by 1991.) Spic and Span can be mixed to a paste or strong solution for heavy jobs, or to a weak dilution for lighter cleaning. By contrast, each Spiffit carries a premeasured dose of cleaning agent. Spic and Span can be applied with a sponge, towel, rag, mop, or scrub brush. Spiffits' cleansers are impregnated in a towelette – no options there. Spic and Span is an all-purpose cleanser. You need five different types of Spiffits, according to its marketers, to do common household chores. Spic and Span is "inactive" when stored in powdered form, so it has little odor outside the box, and it retains its properties as long as it stays dry. The wet cleaning solutions in Spiffits are volatile, which causes a strong odor and diminishes shelf life.

For the occasional one-wipe job, Spiffits may be a tidy answer. But we all have to understand that the premium price we're paying isn't $3.60. Rather, it's the cost behind the unnecessary use of non-renewable resources, and the long-term cost of sending PVC and chemical-soaked plastic towelettes to a landfill just weeks after purchase.

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RESTORATION

Photos by Clark S. Linehan

Ten years ago the sand dunes at Crane Beach – dunes that protected thousands of acres of salt marsh in Ipswich, Massachusetts – were in danger. The footsteps of 400,000 yearly visitors and the tires of beach-maintenance vehicles had killed the grass and shrubs that anchor sand dunes. With no vegetation to trap sand, a dune can migrate up to 100 feet a year, or simply disappear. The dunes were worn down so dramatically that waves from a winter storm might have broken through the four-mile barrier beach to destroy the calm, fertile marsh beyond.

Behind Crane Beach (part of the 1,400-acre Richard T. Crane Jr. Memorial Reservation), three winding tidal rivers form a rich habitat. Deer feed on the vegetation. Birds eat the insects. Fish that are spawned in the quiet waters later return to the sea. But without dunes to absorb the energy of the ocean's crashing waves, the marsh couldn't exist. The Trustees of Reservations, a non-profit agency that manages 71 Massachusetts parks and refuges, recognized the importance of the barrier. In 1983, they commissioned Dr. Paul Godfrey, a well-known coastal botanist at the University of Massachusetts at Amherst, to study the dunes and the impact that weather and human visitors had on them. Dr. Godfrey and his assistant Lars Carlsen identified the vegetation, noting threatened species. They found two plants rare in Massachusetts – seabeach needle grass and Rich's sea-blite.

In 1984, Dr. Godfrey presented his restoration plan to the Trustees, and the following year the project got under way. In 1985 and '86, the Trustees installed three miles of low wooden fencing to protect the grass. They built three boardwalks – totaling 850 feet – from the parking lot to the beach. Each year residents of Ipswich turn out to help with the laborious task of planting 10,000 American beach-grass plants, a few stalks at a time.

"The theory is that a person never touches the dune," said David Rimmer, the wildlife biologist hired by the Trustees in 1985 to implement the restoration. "It's made a tremendous difference." Plaques on the boardwalks effectively explain the delicate nature of the dune landscape; visitor respect and compliance has been excellent. Although a nature trail still winds through the reservation, it is confined to erosion-resistant areas.

Erosion has been halted, even reversed. Says Mr. Rimmer, "The dunes are lush. They're growing and new dunes are forming. We have high dunes covered with beach grass, instead of dunes that look like a desert." *– Hannah Holmes*